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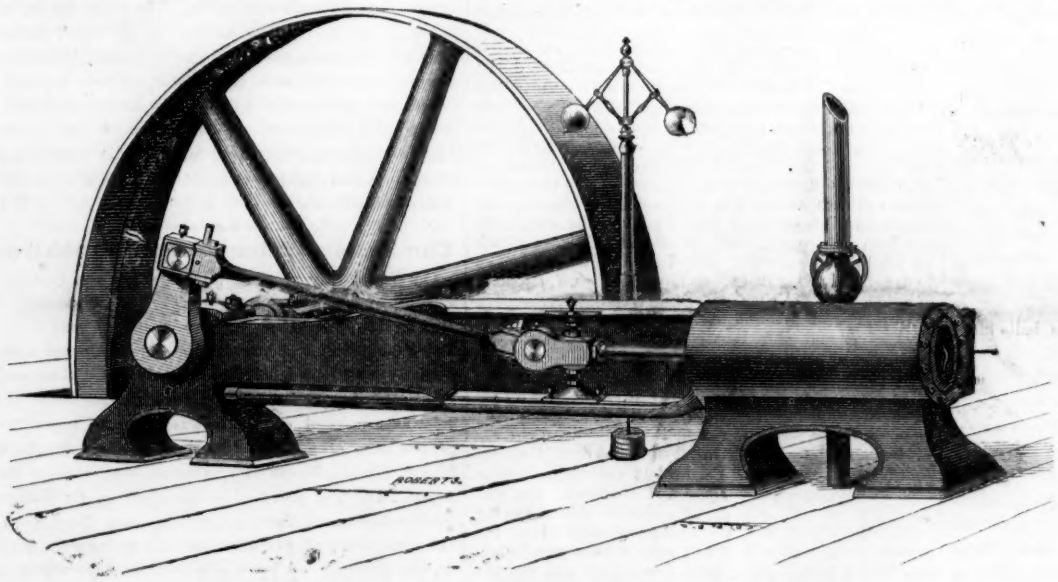
The Babcock & Wilcox Steam Engine.

The engravings herewith given represent the Babcock & Wilcox Steam Engine. The largest engraving gives a perspective view of the engine, already introduced to our readers in an advertisement of the Erie Bason Iron Works, and now announced in the cards of the manufacturers in other localities.



THE BABCOCK & WILCOX STEAM ENGINE.

Fig. 3.

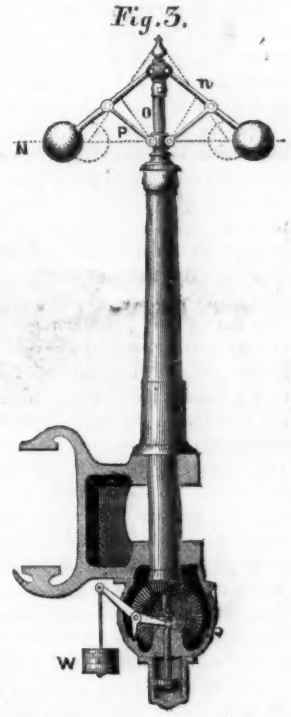


Fig. 1.

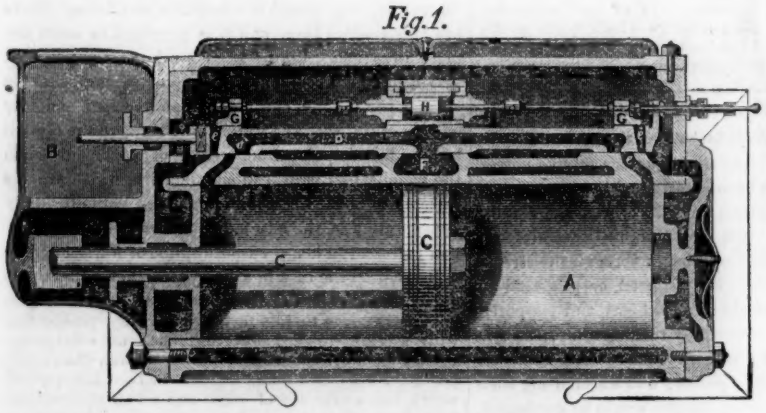


Fig. 2

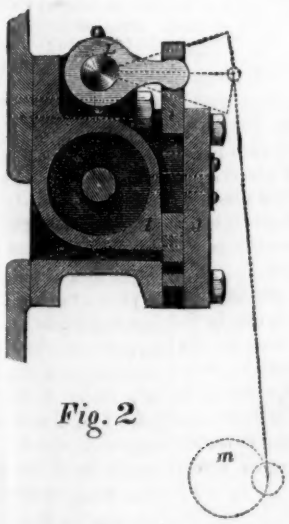


Fig. 1 represents a horizontal section of the cylinder and valves, showing the peculiarities of the cut-off motion. A is the cylinder, which is steam jacketed as are also the heads. B is a portion of the bed piece, which forms also the front head of the cylinder. C is the piston and C' the piston rod. D is the main valve, On the back of the valve at either end is a slide, G, which can be made to cover the port at that end, and these slides are each attached to one end of a piston, H, fitting in a small steam cylinder bolted to the back of the valve, and so adjusted that when the port in one end of the valve is closed the other is open. Upon steam being admitted to either end of the piston, H, the piston is shot over and the corresponding side closed to cut off steam from that end of the main cylinder; while the port at the other end of the main valve is opened ready to admit steam to the other side of the main piston, when the valve shall arrive at the proper position.

It will be observed that the cut-off slides, G, are al ways balanced when moved. The one about to close having steam of equal pressure upon each side, while the other one has been balanced by the main valve riding past the end of the valve face on the cylinder, thus admitting steam behind the slide, G. This condition obtains during the whole stroke of the piston until the steam is cut off, after which the cut off slides, G, remain stationary relatively to the main valve, until ready to cut off steam on the return stroke, previously to which time they have been balanced by the overriding of the valve at the other end. These slides, have, therefore, literally no wear, and once fitted tight, they will remain so indefinitely. The piston, H, in the small cylinder, is turned to fit, and has no packing, neither have the rods stuffiing boxes, as the pressure is equal on both sides, except during the inappreciable time which intervenes between the exhausting of the cylinder, I, and the movement of the piston. The only tendency to wear in these parts is due to the weight of

the piston and rods, which is supported on large surfaces. In fact, after twenty months constant use, none of these parts have worn sufficiently to obliterate the tool marks upon the surfaces.

Steam is admitted alternately to each end of the piston, H, at every revolution of the engine, causing the cut-off slides to move at every stroke, cutting off the steam at the point determined by the governor.

Fig. 2 shows a cross section of the cylinder, I, and its valve. This valve is balanced by the plate, J, upon its back, and is operated by a toe upon the rock shaft, L, carried upon the main valve, and extending through the end of the steam chest where it receives motion from a crank, M, which is adjusted in its position by the governor. The exhaust ports of the cylinder, I, are made upon the bottom, and are at a little distance from the end, while the steam ports are upon the side and at the extreme end of the cylinder. By this arrangement the piston closes its own exhaust port and cushions on the remaining distance, thus dispensing with all dash pots or air cushions, and causing the valve to work without any noise.

The valve i, being balanced, and the rod, L, carried through its stuffing box by the main valve, there is the least possible power required by the regulator to adjust the crank, m, thereby causing a more sensitive action than can be attained where the governor has labor to perform.

The governor is peculiar and is shown at fig. 3. The balls, N, are hung upon arms in the usual manner, which arms are jointed at their upper ends to a head attached to the rod, o, which slides within the hollow shaft that drives the balls; the motion being communicated through the radius rods, p, which are jointed at their lower ends to the gearing shaft, and at their upper ends to the center of the arms, n. The rods p, are half the length of the arms, n, measuring from the center of the ball, and it will be readily seen that in consequence of this arrangement the arms, n, and rods, p, form a parallel motion and compel the balls to move outward in a horizontal plane.

In the ordinary pendulum governor the balls move in the arc of a circle and rise as they extend. It therefore requires an increased speed to maintain them in their advanced position. The engine must consequently run faster when the load is light than when it is heavy, and such is the case with all ordinary governors. In this improved governor it will be seen that the gravity of the balls has no tendency to move them in either direction, and exerts no influence whatever upon the speed of the engine. The centrifugal force causes them to diverge, and a weight, W, tends to bring them towards the shaft. When therefore these two forces are in equilibrium the balls will remain in the same position, but as either preponderates they are moved in a corresponding manner, thus effecting the speed of the engine by varying the amount of cut-off. The weight, W, is supported upon a bent lever which is so proportioned, that the centrifugal force at any given speed will just balance the weight in all positions. The speed of the engine will, therefore, remain at that fixed point with all variations of load or pressure of steam; for any increase or diminution will cause either the balls or weight to preponderate and the point of cut-off to be changed until the speed is again brought to the standard where the two forces are in equilibrium.

Any desired speed can be obtained by altering the weight, W, and the action of the governor will be as perfect in one case as in any other. A spiral on the rod, e, serves to advance or retire the crank, m, relatively to the main crank, so as to cause the cut-off to occur earlier or later in the stroke, as the balls diverge or converge; and the amount of this adjustment is such that the cut off may be varied from nothing to seven-eighth stroke.

THE NATIONAL DEBT.—This debt was, on the first day of August, two billion, five hundred and eleven million, three hundred and six thousand, four hundred and twenty-six dollars and one cent. Owing to heavy receipts from internal revenue, the whole debt has decreased eighty millions in the month of August.

Separation of Silver from Lead—A New Process.

[From the London Mining Journal, August 17.]

It is well known that the affinity of zinc for silver is greater than that of lead, yet the various attempts which hove been made to take advantage of this property in connection with the extraction of silver from lead have not been attended with commercial advantage. The causes of failure have, probably, been attributable to the large quantity of zinc which has remained in the lead as prepared for the market; the treatment of scummings composed of lead, silver and zinc have, of course, offered equal difficulties. To remove these obstacles is the object of the invention of Mr. Frederick Cordurie, of Toulouse, the two characteristic features of which are, on the one hand, the employment of superheated steam to oxidize the zinc, and leave the lead and silver unattacked; and on the other hand, the forcing of oxides of zinc and of lead through a bath of lead, from which the silver is to be separated. The lead to be treated having been well melted, he subjects it for a time to increased heat, after which he adds to 100 parts of lead about two parts or more of zinc, taking care to stir it well in the midst of the bath in fusion, which is then left to itself, until the time when the surface begins to coagulate This time should not be lost; the melted zinc taking possession of the silver to produce an alloy less dense and less fusible than the lead rises to the surface and begins to coagulate, while all the lead preserves its limpidity; it is now that the scumming must be performed, care being taken to remove the least possible amount of lead, but leaving none of the alloy in the bath. To remove the last traces of zinc which remain in the bath, he re-heats the bath, and leads superheated steam into it. When the superheated steam is to be introduced he covers the bath, and the steam is conveyed to the bath by a pipe fitted to the cover and dipping into the bath. The zinc oxidizes under the action of the decomposed steam, and the oxide of zinc floats on the surface in the form of powder, which he scumms off, after which the lead may be allowed to cool for the market. The hydrogen which is disengaged may draw off particles of oxide, which he then collects in a condenser.

In practice it is found that as the scummings contain lead, silver and zinc, they cannot be completely freed from zinc by a simple distillation in a close vessel; this distillation would, moreover, have the inconvenience of allowing some of the silver to be lost. The best means of effecting a complete separation consists in oxidizing the zinc in the midst of the melted alloy by a current of hot air, preferably by a jet of superheated steam, which is admitted at a more or less considerable pressure by employing a condenser, if required. The oxidised zinc, as well as a certain quantity of lead having an earthy appearance, are easily separated from the argentiferous lead in fusion by scumming or equilation. The lead is sent to be submitted to cupellation, and the oxides are regenerated, but they are previously made to traverse a bath of lead, in which they give off any silver which they may have drawn off with them, as well as traces of oxide of lead.

Another part of Mr. Cordurie's invention, relating to the treatment of litharge, is based upon the same principle of the forced passage in a bath of lead. Argentiferous lead submitted to cupellation produces rich litharge. He removes the silver which the litharge contains by making it traverse a bath of lead while the litharge is in fusion. The litharge which floats on the top is marketable, and the lead having become argentiferous is submitted to cupellation.

Ammoniacal Gas as a Motive Power.

[From the Mechanics' Magazine.)

The idea of using ammoniacal gas as a motive power in place of steam has been entertained by many inventors, but has never before, we believe, been successfully carried out. A few years ago, MM. Tellier and Flandrin proposed to propel omnibuses through the streets of Paris by its means. They started, or proposed to start, with a vessel of the liquified gas, and supposed that when this was opened, by turning a tap, the gas would be discharged into a cylinder with sufficient force to drive forward a piston; and water being then admitted to the cylinder, the gas would be condensed, and a vacuum formed, and the piston driven back by atmospheric pressure. Our readers will thus see that the principle of an ammonia engine is pretty much the same as that of Newcomen's steam engine. The plan, if at all feasible, is obviously better suited for stationary than locomotive machinery, and the most reasonable application of ammonia has been made by M. Fromont, who proposes to work a pump by its agency. His engine differs somewhat from that of M. Tellier, inasmuch as he drives the piston in both directions with the gas.

A recent visit to the Paris Exposition has shown us an engine of his actually at work—or, rather, in action, for it was not usefully employed—and driven by a mixture of steam and ammoniacal gas. Strong liquid ammonia is used in the boiler, and the vapor generated is said to be a mixture of at least 80 parts of ammoniacal gas and 20 parts of steam, so it may be fairly called an ammoniacal engine. The principal recommendations of ammonia when applied as a motive power consist in the small amount of fuel required, and the short time it takes to get up the steam, so to speak. The economy in fuel is very considerable, being about one fourth of that required to generate steam alone. As regards the boiler, it may be either of the ordinary forms, the only complete novelty being the apparatus for condensing the steam and ammonia. The gas disengaged (about six atmospheres at 110° Cent., with an ordinary solution of ammonia) does its work in the cylinder and then escapes into the tubes of a condenser, where the steam is condensed and the gas is cooled. The gas then meets with water from an injector which dissolves it, and the solution is carried on into a vessel called the "dissolver," from which it is pumped back into the boiler to do its work over again. The water for the injector is taken from the boiler, and is cooled before meeting with the ammoniacal gas by passing through a worm surrounded with cold water. These arrangements are necessarily a little complicated, and could not be fully understood without drawings. It is, however, satisfactory to see that an ammonia engine is a possibility, and thus power is obtainable where fuel and water are both scarce.

The Nassau Water Works, Brooklyn.

On Wednesday, the 9th ultimo, the Water Commissioners, ex-officio Sewer Commissioners, consisting of Messrs. Gamaliel King, Daniel Northrup and P. G. Taylor, his Honor Mayor Booth, and Aldermen Armfield, Bergen, Hinsdale, Hathaway, Whiting, Guck and Brady, of the Water and Drainage Committee of the Board, proceeded on the annual tour of inspection of the line of works. Mr. Thomas Cantrell of the Water Commissioners' Department, was also of the party. The first point of inspection was the Ridgewood reservoir on Nostrand avenue, East New York. Here are two basins or divisions containing pure, fresh water, pumped up by a powerful engine, which is located about half a mile lower down the road. These cover about thirty-one acres. It is contemplated to build another reservoir here in the course of the next two years which will occupy eighteen acres. Proceeding thence to the Ridgewood pumping engine, which forces the water up to the reservoir from the conduit, the party viewed the ponderous machinery at work. Everything was found in admirable condition. There are two engines here, and it is proposed to erect one more in a short time. Each stroke of the powerful piston or pump rod and each engine accomplishes ten strokes per minute, and pumps one thousand and fifty gallons of water. The water flows through the conduit leading to this point from a chain of ponds located in the vicinity of Hempstead and Jamaica, which are of a capacity of about forty million gallons, while the daily consumption of the city is little more than fifteen million gallons. When the consumption of water is greater, as will be the case in a few years, they will have to go further east on the island for water, and the Commissioners, alive to this fact, are already prospecting with a view towards meeting such an emergency. Paisley's pond, Jamaica pond, Clear stream, Simonson's pond, Cornell's and Pine's ponds and East Hempstead, which has a capacity of eight and a half millions gallons, were all visited in turn, and presented a most favorable appearance. Indeed, as the Mayor very happily remarked, it would be well if many thousands of the citizens of Brooklyn would but visit the sources from which they derive water, that they might from personal observation be satisfied that there can be no purer water in the country than that with which they are at the present time supplied.

Advantages of Gas.

[From "Clegg on the Manufacture of Coal Gas."]

It should be scarcely necessary, at the present day, to insist on the superiority of gas over other means of artificial illumination. But prejudices still linger against its use in private houses which it is desirable to remove; and there are some points of advantage which gas possesses that require to be more extensively known. We will, in the first place, dispose of the objections to the introduction of gas into dwellings, which are founded almost entirely on its assumed danger and insalubrity.

It is, perhaps, the best answer to the alleged danger of using gas, that the fire-insurance offices are now so fully convinced of its safety, that they neither make any extra charge where it is used, nor do they require any notice when it is laid on. This practical estimate of the safety of gas is founded on the experience that houses into which gas is introduced are in less danger of taking fire accidentally than where candles and lamps are burned, with their constant liabilities to emit sparks, with the danger that arises from the careless dropping of unextinguished snuffs and the carrying about of lighted candles.

The insalubrity of gas is alleged to be occasioned by accidental leakages, by the contamination of the air during its combustion, and by the oppressive heat produced by the flame. It may be said, in answer to the first of these objections, that a small quantity of carburetted hydrogen gas mixed with the air we breathe is not prejudicial to health. Even admitting it to be so, the escape of gas is so readily detected by the smell that when the least leakage occurs it makes itself known, and may be quickly prevented. The superior manner in which gas-fittings are now generally made and adjusted, has also greatly diminished the liability to leakage, the inconvenience and danger of which have been much exaggerated.

The contamination of the air during combustion is an objection that may be raised against all kinds of artificial illumination, and more strongly against candles and lamps than against gas. The following forcible observations by Mr. Lewis Thompson set this point at rest.

"There are thousands who firmly believe that coal gas in burning gives off some highly deleterious agents, from which wax, tallow, oil and even coals themselves are entirely free; and this belief is supposed to possess corroborative testimony in the shape of facts displayed in the creation of disease, or in the misconceived opinions of medical men. Now the real truth of the matter is, that whether gas be burnt under the name of gas, or not, can make no difference to the advocates of this strange prejudice; for under all circumstances, used in the ordinary burning of wax tallow, oil, etc., it is gas, and nothing but gas, that is burnt; the only difference being that coal gas is always purified before it is consumed, whereas the extemporaneous gas of a candle or lamp is consumed without being purified at all; and hence, light for light, it must and does vitiate the air of an apartment vastly more than coal gas. If, therefore, it be true that gas is insalubrious, then wax and oil must be decidedly more so, from the simple fact that all the impurities they evolve pass into the atmosphere of the localities lighted, whereas the great bulk at least of those from coal gas remain at the gas works. The actual question for the public to consider is, not whether the burning of gas be injurious to health, for in one shape or other gas must be burnt to procure light; but the point is, whether it is better to consume for this purpose gas of a pure or impure quality."

The production of gas light is, indeed, closely analogous to that of flame produced from the direct combustion of tallow, wax, or oil. Those substances consist principally, in common with coal, though in a purer and more concentrated form, of carbon and hydrogen, which are capable of being converted by the agency of heat into carburetted hydrogen gas. In the candle or lamp the capillary tubes of the wick serve the office of the retorts in which the coal is distilled in gas-making; the heat of the flame produced by the combustion of the gas being sufficient to decompose the oil as it successively rises in the cotton, and thus continuously affords a fresh supply of gas to keep up the flame. In the lamp and candle the oil or tallow must be decomposed and converted into gas before flame can be produced, just as much as if they were put in a heated retort and the resulting gas were conducted by a tube to the burner.

The whole difference between the gas light process and the miniature operation of a lamp or candle, consists in having the distilling apparatus at a distance instead of being in the wick, and in transmitting the gas, after having been stored up in the gas holder, through pipes, to be burned as it issues from an aperture, instead of burning the gas the instant it is generated on the spot where it is produced.

It may perhaps be contended, by those who are prejudiced against gas lighting, that even admitting the flame of a candle to arise from the combustion of extemporaneously formed gas, it is made from a purer material than coal, and is consequently less injurious. Some experiments by Mr. Lewis Thompson have, however, shown the complete fallacy of that opinion. The comparison was instituted between pure wax and ordinary 13-sperm-candle gas. The wax was found by analysis to contain in 100 parts by weight,—Carbon, 78·2; Hydrogen, 12·1; Oxygen, 9·7. And the analysis of the gas proved it to contain,—Carbon, 75·1; Hydrogen, 26·4; Oxygen, 1·5.

It was ascertained that 5 cubic feet, or 1,064 grains, of the gas gave as much light as 1,885 grains of the wax, when every attention was paid to the trimming of the wick. But the 1,885 grains of wax, according to the analysis, contained 1,474 grains of carbon, and must therefore have generated during combustion 5,404 grains of carbonic acid; whereas the gas only contained 767 grains of carbon, and consequently generated only 2,812 grains of carbonic acid. Thus during the production of equal quantities of light by the combustion of the wax and of the coal gas, the air was contaminated with nearly twice as much carbonic acid by the wax as by the gas.

A nearly similar result was attained by other means. The flame of coal gas, and the flames of several combustible bodies that gave an amount of light equal to it, were burned separately in given quantities of atmospheric air, and the times were noted at which the flames were extinguished by the contamination of the air. The following were the results:

Colza Oil was extinguished in . .	71 minutes.
Olive Oil	72 "
Russian Tallow	75 "
Sperm Oil	76 "
Stearic Acid	77 "
Wax Candles	79 "
Spermaceti Candles	83 "
Coal-Gas (13 candles)	98 "
Cannel-Gas (28 candles)	152 "

The preceding numbers may be taken to indicate the comparative salubrity of the several illuminating materials, from which it appears that the atmosphere of a confined room lighted by cannel gas would support life twice as long as the atmosphere of the same room lighted equally by tallow candles.

Nor does the complaint that is frequently made of the heat of rooms lighted by gas, afford a much better foundation for an objection to gas lighting than its assumed insalubrity. The fact may be true that a room lighted by gas is hotter than when lighted by candles, but the cause is to be attributed not to the greater heat-giving power of the gas, but to the greater illumination when gas is employed. If persons would be satisfied with the same dim light to which they are accustomed when burning candles, or if they would increase the number of the latter so as to equal the light of the gas flame, the heat given out would be found to be less when burning gas than when burning lamps or candles. It has, indeed, been proved by experiment that the combustion of colza oil produces nearly twice as much heat as the flame of cannel gas of the same standard of luminosity, and that in comparison with ordinary 13-sperm-candle gas the proportionate amount of heat are as 78 to 68. A room lighted with a large moderator lamp burning colza oil is perceptibly heated quite as much as by a gas flame that gives a larger amount of light.

Having shown that the objections raised to the introduction of gas into dwellings have no substantial foundation, it will not be difficult to prove that important advantages are gained by its adoption. The economy of gas lighting is generally admitted, and the extent of the saving it effects has been clearly set forth by Mr. Rutter, in a small pamphlet, entitled "Gas in Dwelling-houses," published by Messrs. Parker & Son, from which the following is an extract:

"The only correct method of estimating the relative cost of gas light, and of that obtained from tallow, wax and oil, is by instituting the comparisons with equal quantities of light; each of the light-giving materials being used under the most favorable circumstances, and strictly in accordance with the plans pursued in actual practice. When gas is first introduced, it rarely happens that persons are satisfied with the same quantity of light as they had previously possessed. So long however as this extra supply is kept within moderate limits, it will cause no material difference in the results of the following calculations, since, with ordinary care, there need be no waste in the use of gas, whilst the most skilful management will not prevent waste with candles and lamps. Adopting as standards of comparison the following prices, namely:

Tallow candles (dips)	6*d* per lb
Tallow candles (moulds . . .	8*d*. per lb.
Composition candles	1*s*. per lb.
Wax candles	2*s*. 4*d*. per lb.
Solar and pale seal oil	8*s*. per gallon.
Sperm oil	8*s*. per gallon.

The relative cost of equal quantities of light from each material, as compared with gas, at the respective prices, will be shown by the Table.

"*Comparative Cost of Light from Candles, Lamps and Gas.*"*

	Quantities & prices of candles and oil.		Quan.'s & prices of Gas.		
			Cubic Ft.	7*s*. per 1000.	6*s*. per 1000.
		s. d.		*s. d.*	*d.*
Tallow candles (dips)†...	1 lb.	0 6	21	0 1½	0 1½
Tallow candles (moulds)	1 lb.	0 8	21	0 1½	0 1½
Composition candles‡ ...	1 lb.	1 0	25	0 2⅛	0 1¾
Wax candles..	1 lb.	2 4	25	0 2⅛	0 1¾
Solar and pale seal oil§	1 gal.	4 0	175	1 2¾	1 0¾
Sperm oil	1 gal.	8 0	217	1 6¾	1 3½

"On referring to the Table it will be seen, that where the price of gas is, for example, 6*s*. per thousand, a quantity sufficient to produce light equal to that to be obtained from a pound of tallow candles at 8*d*. will cost only 1½*d*., that is, less than one-fourth, and compared with wax candles, the cost of gas light is only one-sixteenth; so also in comparison with the cheapest kinds of oil, the cost of gas light is little more than one-fourth, and compared with sperm oil, it is less than one-sixth."

(To be continued.)

* The prices of candles and oil, although subject to occasional alterations, are tolerably uniform at the same periods, in all parts of the kingdom. It is not so, and never will be so, with respect to the prices of gas, which, to a great extent, are dependant upon local circumstances.

† Although dip candles cost less than moulds, they are liable to greater waste, and consequently cost, as respects light, as much as, or more than, the latter.

‡ The average duration of composition and wax candles is less by two hours than that of common candles, but they yield more light, very nearly in the proportion of six to five.

§ If common oil be not used in a lamp expressly adapted for its perfect combustion, the waste of oil and deficiency of light will be so great as to render the cost of light actually obtained equal to double the amount at which it is here stated.

Petroleum Exported from Philadelphia and New York.—From January 1st to the middle of September, 1867 and 1866, the quantity of petroleum exported from Philadelphia and New York was as follows:

	1867.	1866.	Increase.
New York (gallons).. 21,231,928		20,326,601	904,927
Philadelphia (gallons).....19,680,327		16,866,247	5,814,070
Total..... 40,911,855		37,192,358	3,718,997

It will be remembered that when the oil trade was first developed, the only then existing railroad outlet from the oil region was to New York, where, consequently, the first accommodations were provided for the export of oil to foreign countries. Now, however, the facilities provided at Philadelphia for the export of petroleum are superior to those provided at New York, and the per centage of increase exhibited in the shipments from Philadelphia show that her advantages are operating potentially in her favor. The great carrier of oil, present and prospective, is the Pennsylvania Railroad Company, which in 1866, on their main road, from their Pittsburg and Alleghany junction, carried 773,625 barrels, and on the Philadelphia and Erie Railroad, operated under lease, 773,125 barrels, making the total quantity moved 1,546,750 barrels. The Pennsylvania Railroad is, in all respects, in better condition for handling petroleum freight than any other line to tidewater.—*Mining Register.*

Coal Gas.

Six lectures delivered at the Royal Institution of Great Britain,
By Edward Frankland, F.R.S.

Organic bodies, when exposed to a full red heat, or a heat between redness and whiteness, break up and form new compounds. The decomposition of coals in the manufacture of coal gas is an instance of this general result. The coal is exposed in suitable vessels, called retorts, to a temperature approaching that of bright redness, at which temperature it is resolved into various bodies—some gaseous, some liquid, and some solid. The mixed gases and vapors produced by the action of heat upon the coal are conducted into this two-necked bottle, where the vapors are condensed into liquids known as tar and ammoniacal liquor, which form, as you see, two distinct layers. The uncondensed products pass on into this second vessel, or purifier, where certain offensive compounds, always present in crude coal gas, are absorbed by a chemical agent. From this purifier the gas is conducted by a flexible tube into a small gas holder, which represents the magnificent and immense receivers used by the London gas companies. In these diagrams [a series of large colored drawings displayed on the walls of the theatre] you have a representation of the actual apparatus employed in the manufacture of coal gas. I shall go rapidly over them for technical details do not come within the scope of our present inquiry. We are here to search into the philosophy of gas lighting—to ascertain the chemical principles involved in the preparation and combustion of coal gas. [The lecturer then briefly explained the construction and uses of the retort, hydraulic main, condensers, the scrubbers, purifiers, exhausters, governors, holders, and other apparatus used in gas works.]

Before we can fully appreciate the advantages resulting from the use of the purifying, condensing and regulating apparatus, it will be necessary for us to enter into the philosophy of the production of light by combustion. We have here a gas flame, burning in the usual way—what is the source of its luminosity? The explanation usually given is something like this: Coal gas is a mixture of certain compounds called *hydrocarbons*, or *carbo-hydrogens*; and these, on being decomposed, throw off little particles of carbon which remain suspended for a short time in the flame, and become incandescent, or white-hot. These solid particles are supposed to communicate to the ethereal medium impulses that produce waves of light of all lengths; in other words, they are believed to give rise to the light emitted by the flame, which light forms a continuous spectrum, with no break in it. Various experiments have been adduced in proof of this theory. One of them consists in depressing upon the gas flame a piece of wire gauze. The flame, as you see, is cut down by the cooling action of the gauze, and the so-called solid particles become visible as smoke. [This and the subsequent experiments the lecturer exhibited as he described them.] We get a like result by exposing a piece of white porcelain to the flame, when soot is deposited upon the porcelain. As a further proof, we have the fact adduced that if the gas be mixed with air before its combustion, it burns with scarcely any light; and when the wire gauze or the porcelain is applied to such a flame, we get no trace of smoke or soot If we take the lightless flame, produced by means of a Bunsen burner, and sift particles of carbon into it, we obtain a considerable amount of light. It is further known that those gases contained in coal gas, and which do not deposit sooty matter on burning, give no light. The flame of hydrogen, for instance, does not give more light than that of coal gas mixed with air; but when we sift carbon into it, it does give a certain amount of light. The same is the case with carbonic oxide, which, when burnt alone, gives practically no light. If I increase the temperature of a hydrogen flame by passing oxygen into the interior, we get but little more light than from hydrogen alone; but if I now sift into the flame particles of carbon, a luminosity is obtained much more brilliant than before, because the particles are more highly ignited than in the previous experiment. And though the light is very different from that of the gas flame, yet these experiments appear at first sight to be conclusive in proof of the theory that the light arises from the solid particles of carbon, which are supposed to be produced by the decomposition of the hydrocarbon contained in coal gas. Lastly, the continuous spectrum which the gas flame affords is brought forward to prove that the light must be derived from incandescent solid matter.

Nevertheless, I have, during recent experiments connected with this course of lectures, been led to entertain great doubts as to the truth of this theory; and I propose to lay before you the grounds on which those doubts rest. Let us return to the flame of hydrogen, burning in free air. It possesses the very high temperature of 3776° Fahrenheit. If it be fed with oxygen, instead of atmospheric air, we get a temperature of 7364°; and although it will fuse platinum and dissipate iron wire, still the luminosity is not greatly increased. If we ignite a mixture of oxygen and hydrogen with which we have blown the soap-bubbles contained in this dish, we get a very loud and sharp report, but scarcely any light. In this experiment we have an almost instantaneous combination of oxygen with hydrogen. At the moment of the explosion the resulting product expands to about ten times the volume of the mixed gases, and thus causes an immense wave of air to rush through the theatre, which produces the loud noise that assails your ears. When cool, the product of the combination of oxygen and hydrogen occupies less space than the gases filled before the explosion. The sudden expansion that occurs on combination is simply the effect of the great heat produced. Suppose the combination of a cubic inch of the two gases to be effected at the bottom of a tube, one inch square and ten inches high, the expansion would be sufficient to fill the tube—thus lifting fifteen pounds of atmospheric air to a height of nine inches. That is the work the gases have to perform in expanding to ten times their original volume in the soap-bubbles: and in order to do this, a certain amount of heat must be expended. By the researches of Messrs. Joule and Meyer, we know that amount to be capable of raising the temperature of two-thirds of a cubic inch of water through 592 degs. Fahrenheit, But if this amount of heat were imparted to two-thirds of a cubic inch of steam, it would raise its temperature 2121° Fahrenheit. If we prevent the expansion of the combining gases, the heat produced increases their temperature from 7364° to 9485 Fahrenheit. Let us see what effect these altered conditions have upon the light produced during the combination of the two gases. This glass vessel [a Cavendish's eudiometer] which is strong enough to resist the expansive force of the combining gases, contains the mixture that produced so much noise and so little light when we exploded it in the soap-bubbles. We now ignite the mixed gases, thus confined by means of the electric spark. [The result was a brilliant flash of light.] We had no noise because the gases were not allowed to expand; but we got an intense luminosiy.

It will be said, as an obvious explanation, that the light was caused by the increased temperature; but we found that the increase of 3588° Fahrenheit—the difference between the temperature of hydrogen burning in air and burning in oxygen—did not increase the light. I don't say that this is conclusive, but it is remarkable, and it is not a solitary case. If we take hydrogen and burn it in *chlorine*, we get a little more light than when we burn it in atmospheric air: but still the luminosity is very feeble. Here is a vessel containing a mixture of hydrogen and chlorine, which has been excluded from the light of day, because the action of light induces the combination of these two gases. If we explode this mixture in soap-bubbles, it produces the same intense noise as the mixture of oxygen and without giving much more light. But if we burn it in a close vessel where it cannot expand, the light is intense. Again, on burning *carbonic oxide* and oxygen, under common atmospheric pressure, though we get more light than with hydrogen and oxygen, the increase is but trifling. Burning carbonic oxide in the air, we get, according to Favre and Silbermann, a temperature of 5122°; burning it in pure oxygen, the temperature is increased by 7672°; that is, to 12,794; but the increase of light is very little. Burning the same mixture in a closed vessel, we have a still more brilliant light than before. In all these cases we obtain a powerful luminous effect when the gases are notallowed to expand, although in none of them is there a single particle of solid matter present. [All these reslts were experimentally obtained.]

Many other instances might be adduced of the production of light where there are no solid particles, and the following additional cases will serve to clear the way to the explanation of the true sources of light in the gas flame. The combustion of metallic *arsenic* in a stream of oxygen—effected by placing a fragment of the metal in the bulb of a glass tube, through which the oxygen passes (a hood being lowered over it to carry off the fumes)—gives a great amount of light, though no solid particles are present. Again, metallic arsenic plunged into a hydrogen gas flame volatilizes, and the vapor produces a decided luminosity but inferior to that produced in the stream of oxygen. If, instead of metallic arsenic. we take a piece of arsenious acid—the product of the combustion of metallic arsenic—and try the same experiment upon it, the effects are similar to those produced with the metal. A compound of arsenic has, in fact, been employed in this way as a signal light, It is the basis of the substance called "Indian fire," which has sometimes been used for signalling in trigonometrical surveys. By burning this "Indian fire," we have, virtually, the combustion of arsenic and sulphur in oxygen—we get a very intense light, and yet there is probably no substance in a solid condition in the flame.

Here, then, are many facts and considerations which shake our faith in the theory that the light in the flame of coal gas is due to the presence of solid particles. In the next lecture we will resume this subject, and will endeavor to decide what is the true source of light in a gas flame.

Brevities.

—Water heated in a strong closed vessel, will melt lead in 612 degrees.

—Solid carbonic acid sinks the thermometer to 162° (Fah.) below Zero in two minutes.

—There are now in operation in Chili 10 gold, 12 silver and about 100 copper mines.

—Railroads are projected from Jackson, Tenn., to Paducah, and from Memphis by the river route to Cairo.

—It is said that nitro-glycerine is now in continuous use on the Pacific Railroad for blasting purposes.

—The Common Council of Brooklyn visited the Water Works of that city recently, and found them all right.

—Dr. Crossley, of Lowell, is putting up machinery for making coffin cases from surface slate instead of wood.

—The feed-water of boilers acquire a galvanic effect in passing through the copper tubes of surface condensers.

—This month all the conductors and other employés of the Erie road are to be uniformed, with blue coat, naval cap, and grey pantaloons.

—Lead and zinc are greatly expanded by heat—the latter metal expands nearly two and a half times as much as wrought iron under equal temperatures.

—One thousand cubic feet of ordinary illuminating gas may be readily compressed into a space of ten feet.

—A railroad is grading from Corinth to Pittsburg Landing, and a route is further projected from Pittsburg Landing to Nashville.

—The Imperial Government of China has lately prohibited the printing of newspapers there with movable type.

—Our national product of bullion is now about $100,000,000 per annum—$20,000,000 from placer or gulch gold diggings, and $80,000,000 from quartz mining.

—The tonguing and grooving machiine was invented by Sir John Rennie, an Englishman, in 1814. He used revolving cutters. He was also the inventor of the first machine for planing iron.

—The tubes of tubular bridges are generally painted white, so as to increase the radiation, and diminish the effects of expansion and contraction caused by the alternations of temperature.

Study on Coal Tars and their Products.

EXHIBITED IN 1867.

By Professor H. Dussauce, Chemist.

[Translated for the American Gas-Light Journal from "Studies on the Exposition of 1867," published by Eug. Lacroix, 15 Quaie Malaquais, Paris.]

II. Coal Tar—Treatment.—(*Concluded.*)

We have said before how crystalizable benzine can be separated from the toluene; the three others are separated by similar processes, that is, by successive rectifications. The difference of the boiling points between each one, and which vary from 72 deg. to 78 deg. permits that separation.

Let me add, that like benzine, the cymen crystalizes at a low temperature, which gives a second process of separation for these two oils.

M. M. Th. Croupier and Coblentz Brother, in the French section, have exhibited fine specimens of crystalizable benzin, toluen, xylen, cumen and cymen. M. P. Castellaz crystallizable benzine, toluen and cumen. M. M. Croupier and Coblentz have exhibited products in which the benzin and toluen exist in the most convenient propertions for the separation of the different colors, that is:

Benzin.....	75	40	30
Toluen.....	25	60	70
	100	100	100

In the English section, M. M. Demuth also have fine specimen of the five neutral oils which are, until now, the only produced in a pure state by the industry.

However we must not forget the neutral carburetted hydrogen, the most abundant in coal tar, the naphthaline which can be extracted in the enormons proportion of 20 up to 50 per cent. of its weight.

This product is not much used yet in a pure state; however it has received some applications for the production of colors. Nearly all the exhibitors named above have sent fine specimens of naphthaline crystalized in beautiful white and nacreous rhomboidal lamina, melting at 174°2 and distilling from 413°2 to 446°.

Crude naphthaline, deposited from the heavy oils and from the oils of the second fractioning is, indeed, very easy to purify; it is sufficient to compress it to extract the oils which are interposed, and to sublimate it afterwards. The vapors of naphthaline condense in bright spangles. If it is wanted perfectly pure, it is dissolved in boiling alcohol, from which it separates in crystals by cooling.

Having examined the neutral compounds of the tar, we have to speak of the alkaline and acid ones.

As for the alkaline oils composed as we have seen of carbon, hydrogen and nitrogen, they are in too small a proportion in the products of coal tar to use them industrially.

These organic alkalies will be found nearly all combined with the sulpburic acid used to treat the oils of the first and second fractioning, and which is deposited in the form of a black and thick tar.

To extract them it is sufficient to dissolve the tarry matter in hot water, then allow it to settle, and decant the limpid liquor, which is then saturated with caustic soda. The organic alkalies are separated in the form of oil. Successive distillation and fractionings will obtain them according to their boiling point.

The alkalies, at a high temperature, are exhausted in the same manner in the heavy oils washed with sulphuric acid, but aniline, toluidin and other products of the benzin are now so cheap, that this treatment has no commercial interest.

Treatment of the Residuum of the Oils—Phenic Acid.

It is not the same for the acid oils; several have a great importance now, principally the phenic acid, then the rosalic acid composed of three simple bodies, carbon, hydrogen and oxygen.

The phenic acid (carbolic) having its boiling point at about 370°4, exists in a strong proportion in the oils of the second fractioning of the distillation of coal tar, that is in the products, the boiling point of which is between 302 deg. and 392 deg.

The acid of these oils will be found entirely combined with the caustic soda, used in the chemical treatment, in the form of *phenate of soda.* It is this phenate of soda which is used to prepare the phenic or carbolic acid. The operation is as follows:

1. Dissolve this phenate in a very thick state, in five or six times its volume of warm water, stirring the mass, then let it cool; it separates naphthaline and some oils which swim on the surface of the phenate of soda.

2. Draw off the clarified part of the dissolution in a lower receiver, and saturate it by a little excess of hydrochloric or sulphuric acid diluted with water; when settled the salt of soda falls to the bottom, and the phenic acid and other organic acids which accompany it swim on the surface.

3. Decant the phenic acid in a third vessel and wash it with two waters.

4. Decant anew in a special reservoir, and after separating it from water, submit it to a rectification That rectification is made in a cast iron still surmounted with a head, in which is a thermometer, the bulb of which dips in the vapors.

All the products, few in numbers, which disengage below 366°8 are fractioned, and all which pass between 366°8 and 374° is collected as crude phenic acid.

The phenic acid, condensed in an iron worm, crystalizes by cooling very easily in winter; in summer the cooling must be done in cellars at 50 deg. This acid when crystalized is sufficiently pure for industrial applications. However, to obtain it perfectly pure, the crystals have to be pressed so as to separate the interposed oil. Sometimes it has to be rectified a second time, and then they take only the products which pass exactly at 370°4. The crystals compressed a second time are then verypure, commercially speaking.

All the exhibitors above named have exposed fine specimens of crystallized phenic acid. The Parisian company has exposed, besides, liquid phenate of lime for disinfection. The crude phenate of lime is easily produced by treating the oils boiling between 302° and 392° with a milk of lime, which combines with phenic acid. The solution well decanted and left to settle can be used for disinfecting purposes. Phenic acid disengaging, as chlorine from chloride of lime, very slowly, and being substituted by the carbonic acid of the air. To obtain a pure phenate of lime, liquid phenic acid can be treated by the same milk of lime. The greater part of the soda used to purify the oils from 300° to 392°, can be substituted by a milk of lime, and the operation be completed with a little caustic soda, but this operation is complicated and requires much care.

M. Boboeuf is the first who had the idea to use the dissolution of caustic soda to extract phenic acid. Before him they used liquid caustic potash, which was indicated by Gerrhardt.

Phenic acid is accompanied in the oils of tar by small quantities of other organic acids. The most important is the rosalic acid, of which Lowe & Co., of Manchester, have presented splendid specimens. This acid is not directly extracted from the tar, and is produced by a chemical treatment of the phenic acid. We shall speak of it by and by.

Theoretical Considerations.

Before ending this chapter on the treatment of coal tar, we must mention the efforts made to use the heavy oils containing paraffine in dissolution.

These hydrocarbons very rich in carbon, since by a simple combustion large quantities of lamp black are produced, when submitted in close vessels to a high temperature, deposit a part of their carbon in a state of graphite, and disengage lighting gas and oils containing more hydrogen. The Parisian company has made several trials, and those trials have proven the truth of the practical division of these hydrocarbons. The action of concentrated sulphuric acid on heavy oils, free from phenic acid, produces a similar effect, by reducing the proportion of carbon; this action is utilized to purify those oils and to obtain them, after rectification, colorless enough to apply them to painting and fabrication of common varnishes. That company and M. F. Dehaynen have exposed colors as heavy oils.

To come back to the division by a high temperature, the fabrication of gas by wood as yet done in some places in Germany and Switzerland, give us an example of the influence of a very high temperature.

When wood is distilled in a retort, like coal, the gas disengaged, when pure, has a weak lighting power; but large quantities of tarry oils are deposited after the disengagement of the gas.

If, on the contrary, as is done in manufactories, when out of the retorts all the products of the distillation are passed together through refractory pipes, heated to a high temperature, the tarry oils are decomposed, the gas takes a great lighting power, and the tars change their nature.

Benzine and other oils do not pre-exist in coal, evidently they are formed by multiple reactions at a high temperature between the carbon, hydrogen, oxygen and nitrogen, which enter in their composition. The water contained in the coal, reduced into steam at an elevated temperature, has, without doubt, some influence on these reactions.

The numerous bodies we have signalized in the tar in our first table, are not the only ones existing in that product; other hydrocarbons accompany those bodies, and chemistry very soon will give us the history of several new oils unknown until now, and which are yet being studied in the laboratory.

We have achieved the history of tar and the immediate principles that industry has extracted directly from this precious residuum to be introduced in the trades.

We shall resume these products in the following table, indicating their principal applications and their present approximative cost.

Immediate and Industrial Products Exhausted from the Tars of Gas.

Names of Products.	Approximative Price.	Application.
Fat, dry and liquid pitch	From 6 francs to 9 francs per kilog.	Artificial charcoal. Artificial asphaltum. Agglomerated coal.
Heavy oils of tar, called creosote	From 6 francs to 8 francs per kilog.	Lamp black. Preservation of wood Lighting. Dissolution of dry pitch.
Discolorized heavy oils	From 25 to 30 francs per kilog.	Application in painting and fabrication of varnishes.
Mixture of benzin and toluen	From 100 to 130 francs the 100 kilog., according to the mixtures	Fabrication of composed aniline.
Pure com. benzin		Fabrication of pure aniline.
" " toluen		Fabrication of toluidin.
		Fabrication of colors.
Xylen	Little known yet in trade	Fabrication of xylidin which gives colors.
Cumen and cymen	?	Little known in industry, it forms colors, is used in benzine to clean.
Light hydrocarbons improperly called benzine No. 1	110 francs per kilog.	Cleaning of cloth.
" No. 2	90 " " "	Dissolution of fatty bodies.
" No. 3	50 " " "	Dissolution of India rubber.
		Cleaning of enzines.
		Used to increase the lighting power of gas, etc.
Naphthalin	10 to 20 francs, according to purity	Fabrication of lamp black.
		Destruction of insects
		Preparation of the naphthaline and some other colors.
Phenic acid.	?	Fabrication of picric acid and blue called Lyons.
Liquid.	200 to 800 francs per kilog.	Preservation of organic substances.
Crystalized.		Disinfection.
		Therapeutic agent,
Rosalic acid	For memory	Fabrication of colors.

In this table the franc is equivalent to 17 cents.

In another paper we shall speak of the tars obtained in the fabrication of metallurgic coke, a new manufacture, which has been started in France, and begins to be used in other countries. H. D.

American Tube Well.—A number of gentlemen recently assembled upon the cricket-ground of the Manchester Club, Old Trafford, to witness the sinking of a well upon a system just introduced into this country, of which Mr. Norton, of Blackfriars street, Manchester, is local agent. Water was reached in five minutes from the commencement of the operations, and in twenty-two minutes a depth of ten feet had been reached; the pump had been fitted to the top of the well, and a flow of water obtained. The well consists of an iron pipe 1¼ inch in diameter, about 12 feet long, pointed at one end, and perforated with holes about sixteen inches up the pipe from the pointed extremity. A movable iron clamp is fitted round the pipe, and, upon the principle of pile driving, a 56 pound hollow weight round it is raised, and allowed to drop upon the clamp; thus the pipe is driven into the ground. Earth, sand, etc., first enter the pipe through the holes, and when these are pumped out, the theory is that pebbles rest against the pipe and form a natural filter. About £5 is the cost for the completion of a well 15 feet deep. When rock is reached the operation is more costly if it be necessary to bore the rock. One of these wells, to the depth of 15 feet has been sunk in the Manchester Botanical Gardens. The inventor accompanied the Northern army in the late American war, and procured an unfailing water supply. He has sunk many wells in the States: one at Ithaca, New York, is said to be 120 feet deep.—*London Builder.*

☞ See page 127 for more reading matter

PATENT CLAIMS.

Pertaining to Gas, Mining, Petroleum, Water etc.

69,359.—CUT-OFF FOR WATER SPOUTS.—Henry W. Mosher, (ossignor to himself and Edw. C. Dudley, Aurora, Ill.

I claim, 1st, The shifting pipe, B, and the flange or collar, c, of the horizontal pivoted plate, C, arranged in relation to the conducting spout, A, in such a manner that the lower end of the shifting pipe may be moved horizontally in the arc of a circle, substantially as described.

2d, The combination of the fixed base plate, D, having two apertures, with the horizontal pivoted plate, C, which carries the shifting pipe, when constructed and arranged so that the surfaces of the two plates shall remain in contact while changing the pivoted plate from the cistern pipe to the escape opening, and vice versa, substantially as described.

3d, The shifting pipe, B, sustained so that it will maintain its proper connection with the conducting spout, A, and the pivoted flanged plate, C, by means of an annular seat, b, on the lower end thereof, and the fixed ears or projections, a, a, on the fixed conducting spout, as herein described.

4th, The pivoted flanged plate, C, provided with an annular groove, s, in the bottom thereof, in such a manner as to maintain the relation with the influx opening of the base plate, as herein described and for the purpose set forth.

5th, The filter, G, seated in the influx opening of the base plate, D, the shifting pipe, B, and the pivoted plate, C, all arranged substantially as herein described.

69,360.—WATER WHEEL.—John Mumma, Middletown, Ohio. Antedated Sept. 23d, 1867.

1st, I claim the elongated concave buckets, S, terminating at their upper ends with the cap, V, constructed, arranged and operating in the manner and for the purpose described.

2d, The floating cylindrical gate, C, in combination with the floats, m, lever, B, and rods, D, arranged and operating substantially as described.

3d, The cylindrical rack or screen, H, in combination with chutes, d, and gate, C, arranged as described and for the purpose specified.

4th, The combination of the ball gates, a, with chutes, d, operating substantially as specified and for the purpose set forth.

5th, The rings, h, h, arms, l, chains, b, guide rods, f, and roller, E, arranged in relation to the ball gates, a, substantially as and for the purpose specified.

6th, The chute disk, I, with its packing ring, r, in combination with chutes, constructed and operating substantially as and for the purpose described.

69,370.—MACHINE FOR PREPARING PEAT FOR FUEL.—A. M. Sawyer, Athol, Mass.

1st, I claim the combination of an apparatus for grinding or disintegrating the peat, the endless apron, b, and the squeezing rollers, C, and C', arranged substantially as described.

2d, The combination of the endless apron, b, the squeezing rollers, C, and C', and the scraper, F, substantially as described.

3d, The scrapers, h, h, within the hopper, R, in combination with the series of molds, substantially as described.

4th, Arranging the cams that work the pistons in and out so as to be adjustible as described, so that the movement of the pistons in the direction of the diameter of the mold wheel may be varied, thereby the compressing capacity of the mold be increased or diminished, as described.

69,556.—GAS BURNER.—Joseph S. Ford, Philadelphia, Pa.

I claim the combination of the key, a, and burner, A, with the cone, b, of the base, B, with vent-holes, d, d, substantially in the manner described and for the purpose specified.

69,566.—GAS COCK.—C. B. Littlefield, assignor to himself and T. W. Porter, Boston, Mass.

I claim a gas cock, D, and joint, A, so constructed and arranged that when the cock, D, being open, is turned to a stop in one direction, it will shut the gas entirely off, but when turned to a stop in the opposite direction will nearly but not entirely shut off the gas.

69,594.—MANUFACTURE OF ILLUMINATING GAS.—John W. Smith and Thomas H. Phillips, Washington, D. C.

I claim an improvement in making gas from coal-tar, with the method above described of determining the quality and quantity of gas at any time of the operation by the use of the stop-cock, H, as represented and described.

69,621.—GAS-LIGHT MULTIPLIER.—John F. Boynton, Syracuse, N. Y., assignor to Henry L. Stuart, New York City.

I claim, 1st, A closed box containing capillary material, or its equivalents, with entrance and exit tubes so as to charge gas with volatile hydrocarbons, substantially as described.

2d, A box with a lid and close joints so as to form a carbureting chamber for gas, substantially as described.

3d, A close chamber or box with cloth or other capillary material on rods or supports, substantially as described.

FOREIGN PATENTS.

69,714.—SPIRIT METER.—W. Siemens and J. G. Halske, Berlin, Prussia.

We claim, 1st, The measuring-drum constructed and arranged as herein described, so as to rotate with a spring motion, that is to say, provided with three compartments, so formed that the centre of gravity of the spirit during its influx into said compartment, shall lie in a vertical plane, passing through the axis of the drums substantially as shown and set forth.

2d, The alcoholometer in combination with its index and supporting spring, substantially as and for the purpose herein shown and specified.

3d, The mechanism herein described for imparting to the counterwork a motion which shall at all times be proportionate to the volume of pure alcohol contained in the spirit or liquid which passes through the measuring apparatus.

4th, The combination with the mixing vessel, N, of the pipes or tubes for the induction of the spirit or liquid, arranged as described, so that when spirit of varying strength is conducted into said vessel, the heavier shall enter above and the lighter below the alcoholometer, substantially as and for the purposes set forth.

5th, The combination with the measuring-drum and interior cylinders, K, of the mechanism for obtaining a sample of the spirit, proportionate in quantity to the volume of the said spirit, which is measured, arranged and operating substantially as set forth.

The Fire Extinguisher.

The *Portage Lake Gazette* in alluding to this useful invention for extinguishing fires says: In these times of unapproachable insurance rates, anything calculated to create a feeling of security against danger by fire is especially hailed as a favor. We have seen nothing that so completely fills the bill as the American Fire Extinguisher, which not only makes one feel secure, but will most effectually extinguish a fire in its incipient stages. In appearance it resembles a water cooler with a small rubber hose fitted at the top. Its great recommendation is that unlike many other devices it is always ready, and as soon as a fire is discovered can be put in operation, and will, in a minute or two, extinguish a fire that may have acquired considerable headway. At a trial we saw made at Eagle River a few days since, it operated to a charm. Two packing boxes were filled with sticks and shavings well saturated with kerosene and tar, were allowed to burn till the fire blazed up ten feet above the top of the pile, and till everybody was satisfied it was at its height, when the little machine holding only eight gallons was put on the operator's back (a novice) and the work of extinguishment begun. In less than three minutes there was scarce a live spark to be seen. The machine is simple, being only a tank containing that amount of water charged with ingredients creating carbonic acid gas, which it is well known is death on fire. A public trial will be made in a few days, when all interested can see it for themselves. It is a fine thing for stamp mills, or any other kind of buildings, for that matter, and should be kept as the most certain cure for fire to be obtained in this region.

GAYLORD'S PATENT COUPLINGS,

Fig 5

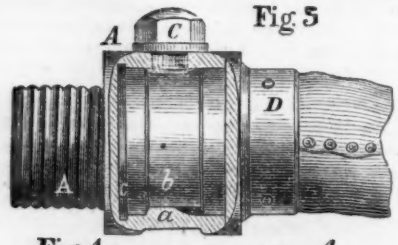


Fig 4

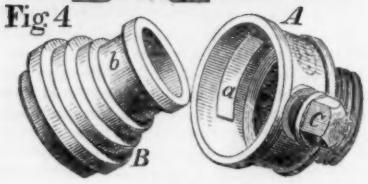
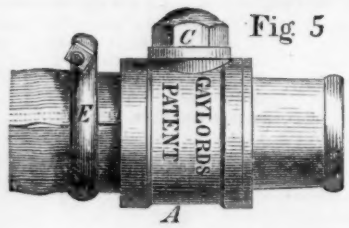


Fig. 5



FOR

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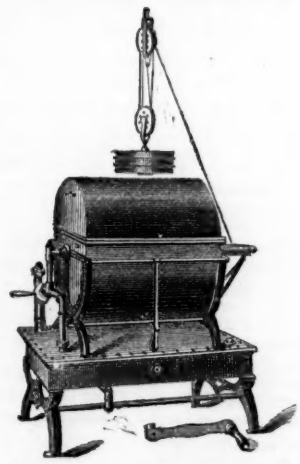

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We manufacture eight sizes of the SOLAR GAS MACHINE, ranging from ten to five-hundred light capacity. Every machine is put in operation and fully tested before it is sent off, and is guaranteed to give perfect satisfaction. This new apparatus is the result of 15 years of experience in this special line of manufacture, and we feel warranted in asserting that our machine excels all others of a similar kind in the market. It is much simpler and more efficient than any former manufacture, and is constructed with special reference to safety and durability. There is no possibility of an explosion under any circumstances whatever, nor is the gas tank likely to leak or give out, or any part of the machine to get out of order, if reasonable care is taken of it. From five to fifteen minutes' attention is all that is required to keep any size of machine in perfect working order to supply all the burner-jets in a dwelling or factory.

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GENTS: We are pleased to inform you that your SOLAR GAS MACHINE, which we have now used in our factory at Mansfield Mass, for more than one year, has given us entire satisfaction in all respects.

In our judgment, with proper arrangement, it is as safe as ordinary coal gas, and the expense of using it we do not consider more than one-half. We cordially recommend it to any who have use for it for similar purposes. (Signed) Respectfully yours,
MERRITT & DRAPER, 12 Maiden Lane

From the Superintendent of the N. J. State Lunatic Asylum.

STATE LUNATIC ASYLUM, TRENTON, N J.,
August 29th, 1866.

MESSRS. O. P. DRAKE & Co.:

GENTLEMEN: I write you to say we have now had a fair trial of your gas machine, having used it, with three hundred lights, since December last; and I have pleasure in reporting that it has given us complete satisfaction in all respects. I have used the oil-gas and find yours much cheaper, and attended with much less trouble. Very respectfully yours,
ROBERT DOBSON, Supt.

From the Superintendent of the Schaghticoke Woolen Mill, N. Y.

SCHAGHTICOKE WOOLEN MILL, N. Y.,
Feb. 27th, 1866.

O. P. DRAKE & Co.: In reply to your inquiry as to the working of the three-hundred-light SOLAR GAS MACHINE, put up by you a this Institution in April last, I have to state that our expectations have been fully met in all respects. . . . The light is excellent in quality, and regular in supply. It has also proved to be economical. . . . I can cordially recommend the machine, etc., etc.

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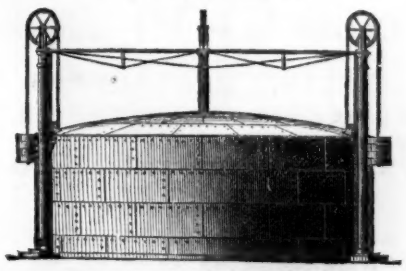

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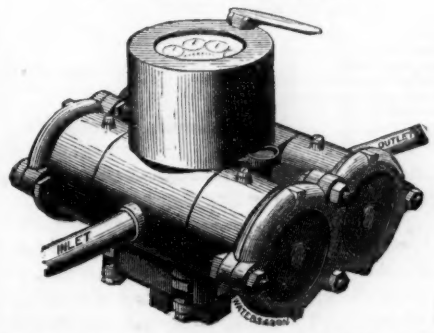

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Published on the 2d and 16th of Each Month

At No. 22 Pine Street, New York.

BRYANT, CALLENDER & CO.,

EDITORS AND PROPRIETORS.

WEDNESDAY, OCTOBER 16, 1867.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

SUBSCRIBERS would confer a favor upon us by remitting CHECKS or POST OFFICE MONEY ORDERS, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 119 and 121 Nassau street, New York, are agents for this Journal. Newsdealers will please send orders to them.

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Answers To Correspondents.

L. P. OF OHIO.—Prince's metallic paint, manufactured and sold by D. Sloan & Co., 115 Liberty-street, will protect gas-pipe and all metals in exposed places. Red lead used a paint will not protect the metal from oxydation when buried in moist earth.

S. A. D. OF ILL.—When the vapor of water is passed through a red-hot tube the water is decomposed. The oxygen enters into combination with the iron to form an oxide, while the hydrogen is left in a free state. The hydrogen evolved is not explosive alone; it burns with a pale blue flame with very little light, but with intense heat.

D. A. OF PA.—One gallon of gasoline will carbonize about 1,000 cubic feet of 12-candle gas, and increase its luminosity to about 18 or 20-candle power. Any of the volatile hydrocarbons derived from petroleum or coal tar will carbonize gas or air, and render it luminous when ignited.

N. L. OF N. Y.—A water-tight cement may be made by mixing equal parts of red and white lead with sufficient boiled linseed oil to make it of the proper consistency. To test air for carbonic acid, pass it through lime-water. The carbonic acid enters into combination with the lime to give the water a milky appearance, and precipitates in the form of carbonate of lime.

"A PLUMBER," OF MASS.—Plumbers' solder is an alloy of three parts lead and one of tin; it is more fusible than lead, and readily adheres to clean surfaces of that metal when it is fused. Fine solder is a mixture of two parts of tin and one of lead; it fuses at 360°. It is used in the process of lining copper. Hard soldering, or brazing, by which two surfaces of copper or brass is made to adhere, is done by fusing together brass and zinc. When this solder is used, the copper or brass requires to be heated to near its point of fusion. The amount of zinc required in the solder will depend upon the fusibility of the article to be brazed. Enough must be introduced to insure its melting more readily than the article to which it is applied.

FAIR OF THE AMERICAN INSTITUTE.

THE BABCOCK & WILCOX ENGINE.

The beautiful and business-like piece of mechanism running in the northeast corner, fairly bears the palm, in the eyes of discriminating observers, among the few objects of substantial and novel interest which a single year's exhibition can boast. Even the crowd of visitors who profess no knowledge of a steam engine, are arrested by the changeless ease and elasticity of its motion, and the striking simplicity of its appearance. Among steam engineers a favorite eulogium seems to be—after taking in the full combination of improvements old and new—"And there's *nothing of* it, after all!" In its entire absence of complexity, it looks like a simple old-fashioned engine. The superintendent of one of our great metropolitan iron works, (a stranger to all concerned) has spent considerable time over the engine with evident enjoyment, bringing his friends to see it, and repeating with high gusto, "It is just the neatest, completest, best engine, that I ever saw!" Another in like position, remarked that it was the first engine in which he had seen every pound of iron put just where it was wanted, and none to spare. These and other remarks of strangers better known than they suppose, who come and go without introducing themselves, indicate the thoroughly satisfactory impression which this new engine is making upon the public mind. When the astonishing testimony of the indicator cards comes to be generally known and credited, the impression will be very different and deeper, and we think we hazard nothing in predicting that it will take its place unchallenged as the standard engine. The great Corliss engine, which has led the advance for a number of years past, in all parts of the world, has achieved diagrams of cylinder pressure exhibiting as high as 71.5 per cent. of the theoretical power of the steam; none higher that we have heard of; and a full average for that and other first-class cut-off engines has been 66 per cent. The new champion shows usually about 90 per cent. and has gone as high as 94.9!

We have no personal interest at all in this matter; we have simply examined and observed, like our friends the practical engineers before quoted, with the zest which a perfect specimen of mind and work naturally excites, and we give the result of our observations as frankly and disinterestedly as they Among other things, we have learned that this masterly combination of all the standard principles with original inventions that must soon assume a standard rank, is the result of years of patient study directed to this one practical end. The problem has been, to realize the ideal of a self-adjusting expansion engine, by mechanism invariably faultless in principle, without one curious piece or expedient of the "rattle-trap" order in the whole system. How difficult a task such a combination has been, the painful contrivances and second-choice forms to which the inventors of our best improved engines have been driven against their will, bear witness. How rigorous must have been the intolerance of make-shifts and second-choices that prolonged the labor of the new invention, its exquisite simplicity tells. Every form selected is not only good, but is that which science and experience have sanctioned as best. Every valve is a plane slide, every valve motion is absolute, and constant in travel, every valve joint is self-perpetuating, every movement is simple, straightforward, positive; all the economies of heat, of metal, of wear and strain, of oil, and of steam, ever put into an engine, are combined. The cutting off of steam at any part of the stroke, from the beginning to the end of it, required by the varying load, is for the first time attained, by an independent motor, nothing more or less than a miniature cylinder and piston within the steam chest, bolted on the back of the main valve, its little valve moved by the governor, and operating an independent cut-off valve which covers the orifices of the main valve, like a flash, at any moment indicated by the variation of the work.

The governor, invented by Watt, and ever since substantially *in statu quo*, is here perfected by a beautiful invention. The heavy lift of the diverging balls, becoming more nearly vertical as they extend their orbit, has always counteracted from five to 30 per cent. of the centrifugal force of acceleration, and of course falsified to that extent both the indications and corrections of irregular speed given by the governor. The new governor extends its balls in a horizontal plane, without any lift at all, and hence without any resistance from their gravity to the most delicate indications of varying speed from varying load or pressure. On the other hand, the progressive excess of centrifugal momentum from increasing speed is neatly counterbalanced by a weight at the bottom of the governor shaft, drawing inward upon the balls, and adjusted to increase or diminish its leverage so as to keep the balls exactly balanced in all positions, so long as a prescribed speed is maintained. The result is, that their position is equally sensitive to acceleration or retardation, and the cut-off is timed with equally delicate precision to decreasing or increasing load.

The most important result, however, is that any change of load, causing a change of speed, disturbs this equilibrium of centripetal and centrifugal tendencies in the balls, and gives them a new position which adjusts the cut off to the change of load, and restores the speed and with it the equilibrium, maintaining the balls in their new position of usefulness until disturbed and readjusted by another change.

Our object in this place, however, is not to give a description, which will be found on the first page, clearly illustrated with engravings. The result of the exact and delicate regulating apparatus, is that the engine in the fair makes the same number of revolutions under ten pounds or seventy pounds pressure, and when a load of forty horse-power was thrown off instantly, in presence of experienced and forewarned spectators, none of them were able to detect a change, where any other engine would have simply "run away." We are informed that 4,000 horse-power of these new engines are already sold, at the highest prices. Where they are built, may be learned from the cards of the several manufacturers, on page 121.

VENTILATION.

The importance of proper ventilation to health and animal life cannot be over-estimated. Pure air is essential not only to the health and longevity of man, but to our domestic animals, and to all warm blooded animals, endowed with lungs. The act of respiration itself is a phenomenon truly chemical in its nature and results, which soon vitiates the air and renders it unfit to support combustion or respiration in animal life, which is combustion also, differing only in degree. When air enters the lungs its vital element, oxygen, enters into combination with the dead and worn out matter—the carbon of the system contained in the blood—to form carbonic acid gas, which is expelled from the lungs in each expiration, and if the subject, be it man or animal, is in a close room without ventilation, the air will soon be exhausted of its oxygen, and its place supplied with an element destructive alike to life and combustion.

The quantity of air taken into the human lungs at an ordinary inspiration averages 40 cubic inches; eighteen inspirations per minute is the average number of a healthy man. The volume of oxygen taken into the lungs is diminished one-half at each inspiration. As atmospheric air is composed of 21 parts of oxygen and 79 of nitrogen, to make it more apparent we will estimate the volume of air taken into the lungs at about one pint, one-fourth of which is decomposed at each expiration. A little mental calculation, by the use of these data, will give an idea of the length of time it will take to exhaust the oxygen in any room when the number of occupants are known. But when it is understood that in the place of the oxygen a deadly poison is substituted, far more injurious than the loss of oxygen alone would be, an idea may be formed of the necessity that exists everywhere we inhabit for a proper ven-

tilation, and more especially where foreign exhalations and impurities enter the atmosphere we breathe, to vitiate the air still more, as is the case where there is decaying animal and vegetable matter, and where certain manufactures are carried on.

Hence we see the necessity to have all hotels, public halls and assembly rooms, churches, school rooms, etc., provided with some efficient and reliable means to constantly renew the impure air within from the pure air without. The same necessity exists in public dormitories and private sleeping apartments, because the human system throws off more carbon in sleep than in the hours of wakefulness.

Our chemical laboratories, soap manufactories and tallow chandleries, stills, bone boiling and pork packing establishments, slaughter houses and many other branches of industry are of a nature to load the air within with artificial poisons, making it totally unfit for respiration, aside from the ordinary causes previously mentioned, and hence are doubly in need of a proper ventilation. Gas-works may be classed among the manufactories that artificially exhaust the vitality of the air by impregnating it with gases not healthful. The retort houses are generally too well ventilated to permit any ill effects, but the washing, scrubbing and purifying rooms are seldom sufficiently—probably never well—ventilated, and often the offices have the same fault. This is remarkable, when it is so easy to have all parts of the gas-works constantly well ventilated, in all seasons, and in any kind of weather, by an agent always at hand. We mean a jet of burning gas. A few pipes or tubes placed in the most *impure* purifying room, with a jet of burning gas at the lower end, while the upper end extends upward to the outer air, and a few openings near the floor communicating with the pure air outside, is all that is necessary to render the air inside always comparatively pure and wholesome.

This plan has the merit of simplicity and effectiveness at all times, because it will always produce an outward current and exit for noxious vapors and gases, no matter what is the climate or the weather. It is not dependent upon any external ventilation or apparatus to act by the wind, which may not blow, nor does it require an expensive motive power to operate it. It is cheap, effective and certain, and can be easily introduced where gas is employed for any purpose. For gas-works it is especially convenient, and it seems to us its general introduction would be of great importance, not only for convenience, comfort and health, but as a preventive to accidents by any leakage, such as occurred at Astoria not long since, and which frequently occurs in private dwellings, for if the air in any room is constantly renewed, leaking gas will not be likely to accumulate sufficiently to produce an explosive mixture.

This system of ventilation has been patented by Henry A. Gouge, of No. 254 Broadway, and has been introduced in many public and private places in this city and elsewhere—St. Nicholas Hotel, St. James, Brevoort, Fifth Avenue Hotel, etc.. and we commend him and recommend it to the public generally, and to gas companies in particular.

IMPORTANT INVENTION.

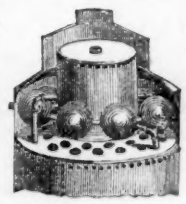
We are pleased to learn that Messrs. Wightman Brothers. 25 Kilby-street, Boston, have lately made very important improvements in gas-burners and gas tips, whereby they can produce a new article of manufacture, having many advantages over metallic or other tips now in use. This new article is the result of a long and expensive series of experiments, where the inventors were met by many apparent scientific and mechanical impossibilities, which have at last been overcome with signal success. The invention, it is believed, opens a new and extensive field of industry, similar to the discovery of the application of sulphur to raw India-rubber, to produce the remarkable change in its nature which we find in "vulcanite" in its thousand forms and applications. So can this raw material we refer to, which is cheap and abundant in this country and elsewhere, and comparatively useless now—be converted by this invention into a valuable commodity which not only can be applied to a multitude of uses, but is absolutely demanded.

Messrs. Wightman Brothers are now perfecting the machinery for the manufacture of gas-tips which was their original starting-point, and will be able to deliver them soon to the trade at $3 50 per gross, with special discounts to consumers of large quantities. These tips are similar to the famous "Steatite" tips, imported from Europe; but the material and labor by this process, owing to the ease of mechanical formation, will be much cheaper than the foreign article can possibly be imported and sold for, and much below that which metal tips can be successfully made for. In conclusion, we are happy to congratulate these gentlemen in their success in opening a new field of manufacture, and in being able to improve and cheapen a specialty, which will probably cause a revolution in the gas-burner or tip business, and doubtless afford a fortune to the enterprising inventors.

THE CONDENSER.

A western correspondent, (letter published September 16th) who appears to have understood us as attributing the invention of the water condenser to a Brooklyn engineer, in our notice of an improvement in the setting of the pipes, and who erroneously attributes it to Messrs. Starr, of Camden, N. J., is informed that the Immersed Multitubular Condenser is the invention of the celebrated gas engineer, SABBATON, and was described from his original tracings, in the AMERICAN GAS-LIGHT JOURNAL of February 1, 1860. We believe the first of these condensers was constructed at Mr. Sabbaton's suggestion by Messrs. Herring & Floyd, of this city, for the Astor House gas works, in consequence of want of room for a condenser of the old kind, and there demonstrated its success and superiority; since when, its adoption has become universal.

DAVIS' PATENT SAFETY Steam Superheating Boiler,



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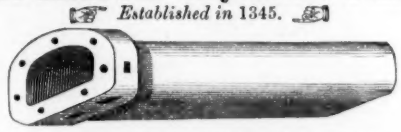

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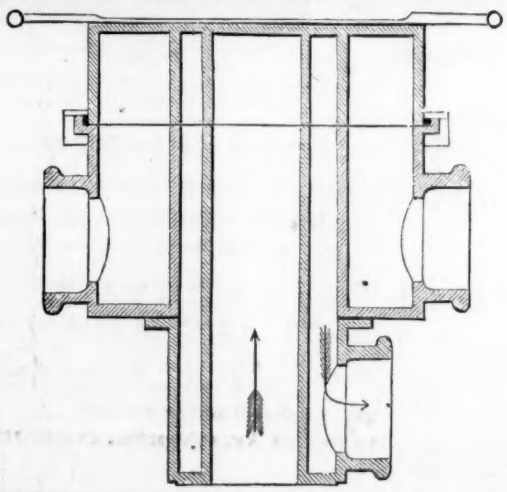

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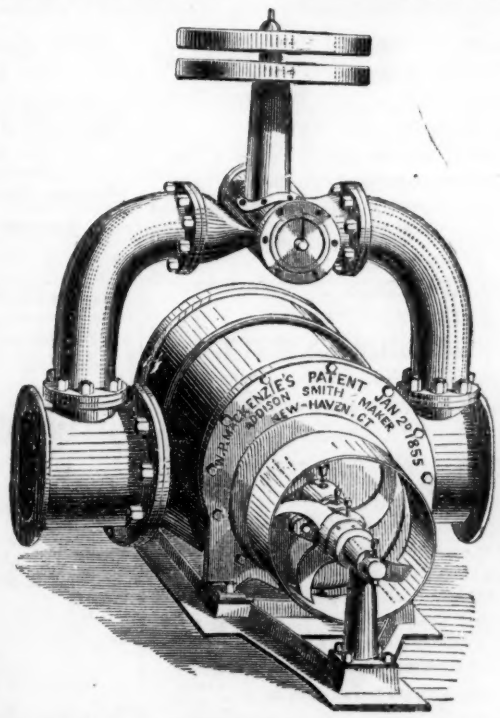

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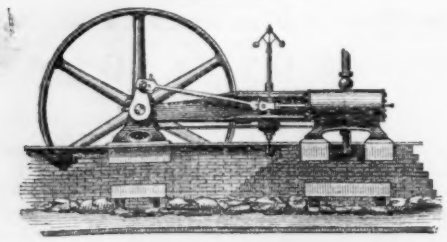

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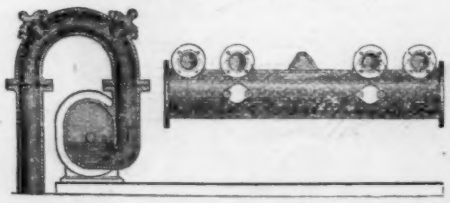

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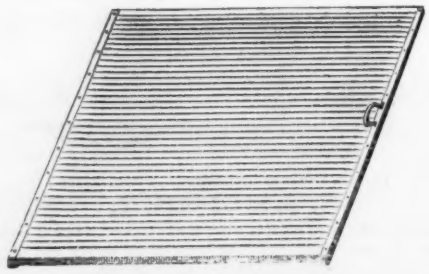

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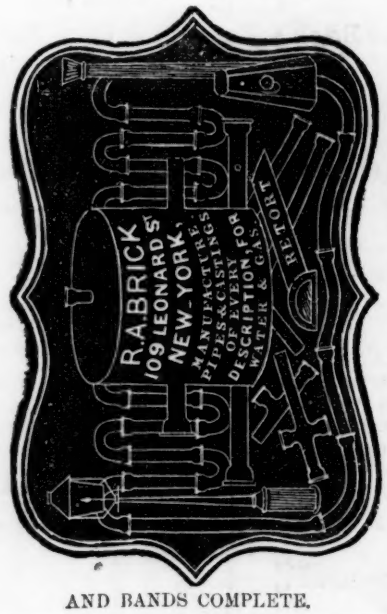

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AND BANDS COMPLETE.

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Gas Fitting and Plumbing,

Nos. 64 & 66 Maiden Lane, cor. William-st.

Residence, No. 1147 Broadway, near 26th-st.

HOUSES FITTED UP WITH PLUMBING AND GAS WORK IN THE MOST MODERN AND IMPROVED STYLE. SEWERS CONNECTED. BRASS AND LATHE WORK. JOBBING IN ALL ITS BRANCHES ATTENDED TO WITH PUNCTUALITY AND DISPATCH.

GAS BILLS REDUCED.

Gas Lights perfected upon New and Unerring Principles.

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At A. T. STEWART'S the gas-lights were improved and the gas bills reduced one-third, amounting to several thousands of dollars per year.—A. O. WILLCOX, No. 40 Wall-st.

At the TRIBUNE ASSOCIATION gas bill reduced upwards of one hundred dollars per month, and better lights given.—SAMUEL SINCLAIR Publisher.

At H. B. CLAFLIN'S, late Claflin, Mellen & Co., gas bill reduced—amount not yet ascertained—but it will be at the same ratio, and light improved.—Mr. BANCROFT.

At WM. SCHIEFFELIN & Co.'s, corner William and Beekman-sts., good light obtained and maintained at all parts of the premises, without additional cost—a result despaired of even by the Gas Co. owing to the deficiency of supply. No deficiency by FIRMIN'S system.

Similar results guaranteed under similar circumstances, or NO CHARGE. 65-88

Worthington's Steam Pump,

Extensively used by

GAS-LIGHT COMPANIES,

For sale at greatly reduced prices. Also, a new and highly successful Pump, driven by water pressure, requiring no attention or repairs, and the most economical water motor yet constructed.

☞ Patent GATES for Water and Steam-stops.

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Manufacturer of all kinds of GAS and WATER PIPE, BRANCHES, CONNECTIONS, T's, ELBOWS, and ALL CASTINGS USED AT GAS AND WATER WORKS.

I offer special inducements to parties wishing to purchase, my Pipe is Smooth, regular in weights, and cast vertically.

N. B.—Pipe from 3-inch and upwards, cast in 12-ft. lengths.

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FOR SALE

THE VALUABLE IMPROVEMENT FOR SAVING and otherwise improving the gas, invented by Dr. J. S. Wood, described in the "Gas-light Journal" October 2d, 1866, is now for sale by State or County rights.

Address J. S. Wood, Patentee, No. 400 Library Street, Philadelphia, Pa.

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Manufacturer and Jobber of

LAMPS,

Petroleum Stoves, &c.

AND IMPORTER OF

Porcelain Shades,

WICKS, &C.,

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[Bet. Pearl and Cliff]

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ALL ORDERS promptly filled for his Patent Petroleum Stoves or Lamp Heaters, which are acknowledged to be superior to any other article of the kind now in use, as regards economy in consumption of oil, as well as simplicity of construction.

These Cooking Apparatus are used like any coal oil lamp, being provided with a sheet metal chimney, in consequence of which they burn without odor or smoke. They radiate no heat into the room, and are therefore very desirable in hot weather.

Also, Nursery and Night Lamps combined, a superior and cheap article for nursery or sick room; has a kettle, cup and pan, complete.

F. H. LOVELL & CO.,

Successors to Alfred Bliss & Co.

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GENERALLY.

Station, Sugar House, Street and Coal Oil Lanterns.

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JOINT STOCK COMPANY.

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LICENSES GRANTED.

PLASTIC SLATE

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The process of reconstructing Slate Stone from a disintegrated state was

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It is a combination of

Pulverized Slate & Viscous Matter,

(the latter possessing qualities of geological and chemical affinity for the former,) and is a development of one of the simple but unalterable tendencies of nature.

As a Roofing Material it Stands Unrivalled.

A mastic—it adapts itself to every shape and slope. Non-combustible, impervious, non-expansive, and undecaying.

Frost does not Crack nor Heat Dissolve it.

The only roofing material ever discovered that will resist the action of the elements as long as the structure it protects. Being susceptible of little, if any wear, from exposure, and

Perfectly Fire-Proof,

It is unequalled as a coating for Railroad and Farm Buildings, Fences, Bridges, bottoms of Vessels, Vaults, etc.

EDDY'S

KEROSENE COOKING AND HEATING Stoves and Ranges.

THESE COOKING STOVES WILL

Bake, Boil, Stew, Fry and Roast

With the greatest economy and facility, and without heating the room in which they are used. They are perfectly simple, operating like an ordinary Kerosene Lamp with a chimney, and are the only kerosene stoves that burn without smoke or odor.

"We have been perfectly astonished to see what a labor-saving, dirt-saving and heat-saving invention is Eddy's Patent Kerosene Stove. Taking the cost of running it, and the result attained, it is the best patent in the market."—[Worcester Daily Spy.

Our heating and cooking stoves are very convenient and economical, especially when a fire is required but a few hours at a time.

Orders for stoves may be sent through the American Advertising Agency, 389 Broadway, New York.

ALEX. M LESLEY,

Manufacturers, No. 605 Sixth Ave., New York.
Send for Illustrated Circular. (136

KNITTING MACHINES,

FOR

Families and Manufacturer.

Something New and Invaluable for Family Use.

We offer the public the simplest, strongest and best Knitting Machine in the world.

It occupies but little space, is portable, and can be attached to a stand or table; weighs about 40 lbs.

It will knit a variety of stitches, the breakage of needles is trifling, the cost of needles is insignificant, and the most delicate material can be knit pure and spotless as the needles are not oiled.

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Send for a Circular—Agents wanted.

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137] 537 Broadway, N. Y.

WEED'S

HIGHEST PREMIUM

Shuttle Sewing Machine.

Has only to be seen and operated to be appreciated.

Call and see for yourself before purchasing. Please bring samples of various kinds of thread (such as is usually found at stores), and various kinds of fabric, which you know the former most popular sewing machines either cannot work at all, or at best very imperfectly.

SUPERIORITY

over any other machine in the market will be seen at a glance:

1st. It runs easily and rapidly, and is so constructed as to endure all kinds of hard usage.

2d. No breaking of threads in going over seams.

3 l. No imperfect action of the feed at uneven places in the work.

4th. The Weed-stitch catches of itself, and will sew from the finest lace to the heaviest leather, and 200 cotton to coarse linen thread.

5th. The Weed Machine will do beautiful quilting on the bare wadding, without using inner lining, thus leaving it soft as if done by hand.

6th. The variety of fancy work that can be done on the

WEED MACHINE,

with so little trouble, make it equal, if not superior, to six machines combined; for instance, it binds, tucks and sews on the band at the same time, and in fact, the

WEED NO. 2 MACHINE,

as before stated, is equivalent to a combination of any six ordinary machines.

Orders for machines may be sent through the American Advertising Agency, 389 Broadway, New York.

Below we give a few prices.

No. 2.	Oil Black Walnut, Ornamented with Hemmer.	$60,00
No. 2.	Oil Black Walnut, Hall Case, Ornamented, with Hemmer.	65,00
No. 3.	Extra Oil-Polished Black Walnut, Half Case, Large Table beautifully Ornamented.	75,00

WEED SEWING MACHINE Co.,
136. 506 Broadway, New York

OPPOSITION LINE.

TO CALIFORNIA VIA NICARAGUA,

SAILING EVERY TWENTY DAYS,

With Passengers, Freights, and United States Mails, on the following first class Steamships:

On the Atlantic Ocean.	On the Pacific Ocean.
Steamship Santiago De Cuba.	Steamship America.
" San Francisco.	" Moses Taylor.
" Dakota.	" Nevada.

PASSAGE AND FREIGHT AT REDUCED RATES.

Sailing days from New York.

1866.	December 20th,	January 10th and 30th.
1867.	February 20th,	March 10th and 30th.
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And so on at intervals of twenty days leaving on the Saturday previous, when a regular sailing day comes on Sunday.

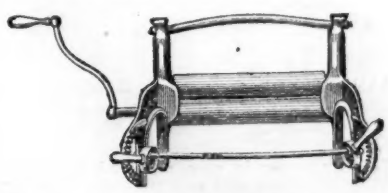
For further information, apply at the Company's office, 177 West-st. corner Warren-st. N. Y.

66tf D. N. CARRINGTON, Agent.

PUTNAM'S CLOTHES WRINGER.

IT IS THE ONLY RELIABLE

Self-Adjusting Wringer.



No Wood-work to Swell or Split. No Thumbscrews to get out of order. Warranted with or without Cog wheels.

It took the First Premium at Fifty-seven State and County Fairs in 1863, and nearly double that number in 1864, and is, without an exception, the *best* Wringer ever made. Patented in the United States, England, Canada, and Australia. Agents wanted in every town, and in all parts of the world. Energetic agents can make from $3 to $10 per day

WHAT EVERYBODY KNOWS, VIZ.:

That Iron well galvanized *will not rust.*

That a *simple* machine is better than a complicated one.

That a Wringer should be *self-adjusting, durable, and efficient.*

That thumb-screws and fastenings cause *delay* and *trouble* to regulate and keep in order.

That wood soaked in water will *swell, shrink,* and *split.*

That wood-bearings for the shaft to run in *will wear out.*

That the Putnam Wringer, with or without cog wheels, will *not tear the clothes.*

That cog-wheel regulators are not essential.

That the Putnam Wringer has *all* the advantages, and *not one* of the disadvantages above named.

That all who have tried it pronounce it the *best* Wringer ever made.

That it will wring a thread or a bed-quilt *without alteration.*

We might fill the paper with testimonials, but insert only a few to convince the skeptical, if such there be; and we say to all, *test* Putnam's Wringer. Test it *thoroughly* with *any* and any others, and if not entirely satisfactory, return it;

PUTNAM MANUFACTURING CO.—*Gentlemen:* I know from practical experience that iron well galvanized with zinc will not oxydize or rust one particle. The Putnam Wringer is as near perfect as possible, and I can cheerfully recommend it to be the best in use. Respectfully yours,

JOHN W. WHEELER, Cleveland, O.

Many years' experience in the galvanizing business enables me to indorse the above statement in *all particulars.*

JOHN C. LEFFERTS, No. 700 Beekman St.

NEW YORK, *January,* 1864.—We have tested Putnam's Clothes Wringer by practical working, and know that it will do. It is cheap; it is simple; it requires no room, whether at work or at rest; a child can operate it; it does its duty thoroughly; it saves time, and it saves wear and tear. We earnestly advise all who have *much* washing to do, with all intelligent persons who have *any,* to buy this Wringer. It will pay for itself in a year at most. HORACE GREELEY.

PRICES—$8, $9, and $10.

Sample Wringers sent, express paid, on receipt of price.

Manufactured and sold, wholesale and retail, by

PUTNAM MANUF'G CO.,

13 PLATT STREET, New York,
BENNINGTON, Vt.,
CLEVELAND O.

C. GEFRORER,

MANUFACTURER OF

Gas Heating Apparatus

OF EVERY DESCRIPTION,

Gas Burners, &c.

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Burners for Wood, Coal Oil and Water Gas. Gas and Lava Burner Tips

Constantly on Hand

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SAMUEL DOWN, WILLIAM HOPPER, R. H. GRATZ, HENRY CARTWRIGHT, RICHARD MERRIFIELD.

THOMAS C. HOPPER, *Superintendent at Philadelphia.*

This Company is now prepared to furnish WET AND DRY GAS METERS, STATION METERS, GOVERNORS, PRESSURE INDICATORS AND REGISTERS, SERVICE and METER COCKS, and all other articles in their line appertaining to the use of Gas-Works.

The combination of Mechanical and Scientific Skill, and the long experience of the several members of the Company, is a sure guarantee of durability, accuracy and excellence of workmanship. Orders addressed

AMERICAN METER COMPANY,

West Twenty Second Street, New York. Arch and Twenty-Second Streets, Philadelphia. No. 23 West Street, Boston will meet with prompt attention.

Harris & Brother, Practical Gas Meter Manufacturers,

Continue, as heretofore at their old Establishment, No. 1117 CHERRY ST., PHILADELPHIA, to Manufacture

WET AND DRY GAS METERS, and all kinds of GAS APPARATUS, and furnish all articles appertaining to the use of Gas Works. ☞OUR WORK WARRANTED—Satisfaction Guaranteed. Orders respectfully solicted, and promptly attended to, by

HARRIS & BRO., No 1117 Cherry st., Philadelphia.

Messrs. Harris & Brother, Philadelphia Gas Works, February 14, 1857.

Dear Sirs;—I take great pleasure in stating that we have found your meters to register with entire correctness, and to be generally of very good quality—the number furnished by you to these works is over 5,000.

JOHN C. CRESSON, Engineer;

Office of the Gas Light Company of Augusta, Ga., March 6th, 1858.

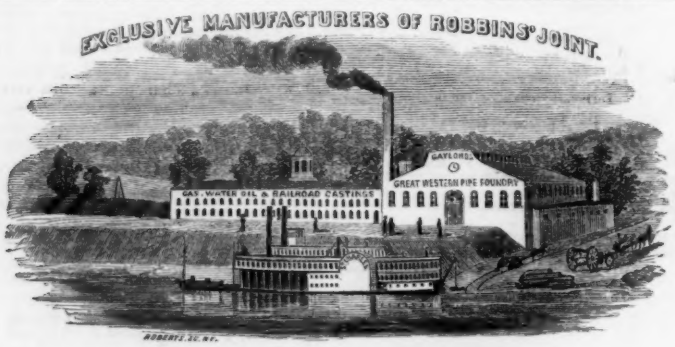
This is to certify that having used meters manufactured by Messrs. Harris & Bro., for the last nine years, we do not hesitate to state they have given entire satisfaction in point of wokmanship and accuracy of registration; they are surpassed by none, and equaled by few manufactories in the Union, we have used meters made by other establishments but our preference is in favor of those made by Harris & Bro., of Philadelphia, Pa.

G. S. HOOKEY, Superintendent of the Gas Light Company of Augusta, Georgia.

Messrs. Harris & Brother, Philadelphia. Philadelphia, March 4, 1858.

Gentlemen—We take great pleasure in bearing our testimony to the very superior character of the meters we have received from your establishment. We have always found the workmanship all we could desire, while the accuracy and reliability of their measurement have always been satisfactory. We have used meters made by other parties, and none have given as entire satisfaction as those received from you. We are, gentlemen, very truly, yours, BIRKINBINE & MEARS.

Messrs. Harris & Brother. March 14, 1857.



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Great Western Pipe Foundry.

EXCLUSIVE MANUFACTURERS OF ROBBIN'S JOINT.

Manufacturers of Gas, Water, Oil and Railroad Castings.

T. G. GAYLORD & CO.,

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T. G. GAYLORD,
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GROVESTEIN & CO.,
PIANO FORTE MANUFACTURERS,

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THE ATTENTION of the public and the trade is invited to our New Scale, Seven Octave, Rosewood Piano Fortes, which for volume and purity of tone are unrivalled by any that have hitherto offered in this market. They contain all the modern improvements, French Grand Action, Harp Pedal, Iron Frame, Over-strung Bass, etc., and each instrument, being made under the supervision of Mr. J. H. Grovesteen, who has had a practical experience of over thirty years in their manufacture, is fully warranted in every particular.

THE "GROVESTEEN PIANO-FORTE"

RECEIVED THE HIGHEST PREMIUM AT THE

CELEBRATED WORLD'S FAIR.

Where were exhibited instruments from the best makers of London, Paris, Germany, Philadelphia, Baltimore, Boston, and New York; and also at the American Institute for five successive years, the gold and silver medals from both of which can be seen at our warerooms.

By the introduction o f improvement we make a still more perfect Piano-Forte, and by manufacturing largely, with a strictly cash system, are enabled to offer these instruments at a price which will preclude all competition.

PRICES

No. 1,	Seven Octave,	round corners,	Rosewood, Plain Case,	$300
No. 2,	"	"	" Heavy Moulding	325
No. 3,	"	"	" Louis XIV style	350

a fac-simile of the accompanying cut.

TERMS—Net Cash, in current funds Descriptive circular sent free on application.

THE AUBIN BALLANCED

VALVE WATER METER,

(Used also for Oils and Liquors)

Is now in use by many City Water Cos, because of its low price, simplicity, durability, accuracy under any pressure, and (a great advantage) because it runs with less head than any meter used. Manufactured by H. Q. HAWLEY, Albany, N. Y.

MORRIS, TASKER & CO,

PASCAL IRON WORKS

[ESTABLISHED 1821,]

PHILADELPHIA,

Manufacture Wrought Iron Welded Tubes for Gas, Steam or Water; Lap-Welded Boiler Flues, GALVANIZED WROUGHT IRON TUBES,

ARTESIAN WELL PIPES,

of Wrought or Cast-Iron, screwed together, flush inside and out; Gas-works Castings, Retorts and Bench Castings for Coal Gas-works,; Cast-Iron Street Mains, Bends, Branches, Drips, &c.

Gas and Steam Fitters' Tools, &c.

Stephen Morris. Stephen P. M. Morris.
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J. VAUGHAN MERRICK, W. H. MERRICK,
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SOUTHWARK FOUNDRY,

FIFTH & WASHINGTON STREETS,

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MERRICK & SONS, Engineers,

MANUFACTURERS OF EVERY DESCRIPTION OF GAS MACHINERY.

Retorts, Bench Castings, Condensers, Washers, Scrubbers, Wet or Dry Lime Purifiers, Coke Wagons, Fire Tools, Wrought Iron Grate Bars, Gasholders, either Telescopic or Single, with Suspension Frames complete; Wrought Iron Roof Frames, for Iron or Slate; Stop Cocks, Exhausters, Steam Pumps, Boilers and Tanks, Steam or Hand Air Pumps for proving Street Mains, Centre Seals, Governors, Wrought or Cast-Iron, Line Sieves for Purifiers, Hoisting Machines for Lifting Purifier Covers.

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CHAS. M. CRESSON,
Late Asst. Engineer of the Philadelphia Gas-works
417 Walnut st., Philadelphia.

GEO. H. KITCHEN & CO.,

NEW PATENT

GAS APPARATUS

For Country Residences, Public Buildings, &c.,

FROM $300 UPWARDS.

EVERY DESCRIPTION OF GAS FIXTURES.

Gas Fitting in all its branches

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THE WOODWARD
Steam Pump Manufacturing Company,

MNUFACTURERS OF THE WOODWARD PATENT IMPROVED

SAFETY STEAM PUMP,

—Adapted for Mining and Fire Purposes—and

Steam, Water & Gas Fittings of All Kinds.

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Formerly 77 Beekman Street.
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JOSEPH LENNIG,

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Wet and Dry Gas Meters,

STATION, SHOW, & EXPERIMENTAL METERS,

Photometers, Pressure Registers, Indicators, and Gauges, Governors, Meter Provers, Centre Seals, Fluid Gauges, &c.

GAS APPARATUS

Of the most reliable and approved construction manufactured and on hand at the

UNION GAS METER WORKS.

R. D. WOOD & CO.,

MANUFACTURERS OF

CAST-IRON PIPE, RETORTS, &c.

Office, 400 Chestnut Street,

PHILADELPHIA.

FINKLE & LYON'S

New Family

SEWING MACHINE

Should be known in

IN EVERY TOWN.

To accomplish this at once and save the expense of a *Travelling Agent*, we offer thus, viz:

Any one sending us orders for two machines shall receive one machine free of charge. This proposition cannot avail after we have appointed a local agent in the town.

We have now completed our *new manufacture* at a cost of some $200,000—introducing *new patents*, and such important improvements, that without fear we are able to offer the following stringent guarantee, viz: After a fair trial, if any purchaser does not prefer the FINKLE & LYON FAMILY SEWING MACHINE to any other, he can return it and have back his money.

This machine has taken many of the HIGHEST PRIZES; *is less complicated than any other first class machine; does a wider range of work without changing; requires no taking apart to clean or oil, no "lessons" to set needle, regulate tension or operate machine.*

Our new Manufacturing Machine is sold on the same terms as the Family Machine.

Please send for a circular with samples of sewing.

Finkle & Lyon S. M. Co.
No. 581 BROADWAY, NEW YORK.

Great Impovrement

IN

Sewing Machines.

EMPIRE

SHUTTLE MACHINE!

Patented February 14th, 1860.

Salsroom, 536 Broadway.

This Machine is constructed on entirely new principles of mechanism, possessing many rare and valuable improvements, having been examined by the most profound experts, and pronounced to be SIMPLICITY and PERFECTION COMBINED.

It has a straight needle, perpendicular action, makes the LOCK or SHUTTLE STITCH, which will NEITHER RIP nor RAVEL, and is alike on both sides; performs perfect sewing on every description of material, from Leather to the finest Nansook Muslin, with cotton, linen, or silk thread, from the coarsest to the finest numbers.

Having neither CAM nor COG WHEEL, and the least possible friction, it runs as smooth as glass, and is

Emphatically a Noiseless Machine!

PRICE OF MACHINES,

COMPLETE:

No. 1, Family Machine, with Hemmer, Feller, Gauge, Braider, & Corder, complete. - - - $60
No. 2 Small Manufacturing, with Extension Table, $75
No. 3. Large Manufacturing, with Extension Table, $85
No 3. Large Manufacturing, for Leather, with Rolling Foot and Oil Cup, 100

One-half hour's instructions is sufficient to enable any person to work this Machine to their entire satisfaction.

Agents Wanted in all Towns in the United States, where Agents are not already established. Also, for Cuba, Mexico, Central and South America, to whom a liberal discount will be given Terms, invariably CASH on delivery.

T. J. McARTHUR & CO.,

536 Broadway.

GAS-BURNERS.

WIGHTMAN BROS.,

IMPORTERS AND

SOLE AGENTS

For the United States and Canada, of

SCHWARZ'S

GERMAN LAVA GAS-TIPS

And proprietors of Winchester's Improved

LAVA TIP GAS BURNERS,

No. 25 Kilby Street,

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T. G. ARNOLD,

MANUFACTURER OF

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And Importer of SCOTCH TIPS,

336 and 338 West 21st street,

formerly No. 447 BROOME ST., New York.

Mercury Cups, Portable Sockets, Burner Pillars, Burner Pliers, &c., &c.

C. GEFRORER,

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GAS-BURNERS,

For Lighting and Heating Purposes.

GAS HEATING AND COOKING APPARATUS; FITTERS' ROVING APPARATUS, &c.

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JOSEPH LEES,

Sole Agent for the sale of

Thompson's Gas Controller

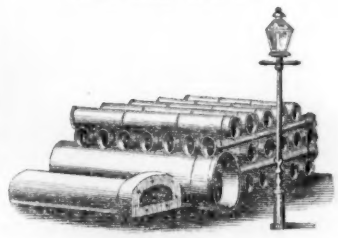
in the States of

CALIFORNIA AND OREGON,

San Francisco, Cal.

LOUISVILLE PIPE WORKS.

Dennis Long, Proprietor.



Cast Iron Gas and Water Pipe of All Sizes Always on Hand.

Retorts.

STOP-VALVES, AND ALL APPURTENANCES FOR EITHER GAS OR WATER WORKS.

All Pipe, &c., Made of the Very Latest Pattern and Improvements.

ALSO MANUFACTURER OF

Steamboat, Portable and Stationery

STEAM ENGINES.

Flour and Saw Mill Machinery—Portable Circular Saw Mills, Shafting, Pulleys, &c., &c.

186-1y DENNIS LONG,
Cor. 9th and Water streets, Louisville, Ky.

SPONTANEOUS COMBUSTION. — Mr. Trevor Clarke publishes some facts explanatory of the unknown causes of sudden fires and explosions in fire-works factories. He remarks that chloride of potash is the most dangerous substance used in the business. Not only will it, when mixed with other substances, ignite sometimes by a shock, but even go over into spontaneous combustion without any apparent cause. A mixture of nitrate of baryta or strontia, sulphur and chlorate of potash, so often used in preparing green and red lights for theaters, etc., may inflame spontaneously when made from recently well-dried substances, and will surely take fire in a few hours, when placed in a moist locality. Clarke witnessed such spontaneous combustion. First, a yellow gas was developed, then the mass melted in several places, a hissing sound was heard, more gas developed, and soon the whole mass was in a blaze of fire. The same was observed when black oxide of copper was introduced in the mixture to make a purple fire. The addition of small quantities of sulphuret of antimony prevent the ignition of mixtures containing chlorate of potash. Carbon possesses the same quality of preventing such combustion, but not to so reliable a degree. But any of these mixtures will ignite when moist and drying them at a temperature slightly too much elevated.—*Scientific Press.*

The American Association for the Advancement of Science commenced its annual session for 1867 at Burlington, Vt., on the 31st of August. Prof. J. S. Newberry is President, and Dr. Walcott Gibbs, Vice-President. An interesting and instructive session is expected.

The New Haven building-block company are manufacturing patent brick having a long narrow slit or air-chamber, which they claim will keep buildings constructed therewith cooler in summer and warmer in winter than when built with ordinary brick. The bricks are made of a mixture of cement and shell lime.

The New Bedford glass company has recently begun to manufacture porcelain glass for photographic plates.—They are blown in hollow cylinders four feet long, cut longitudinally, flattened in a furnace and cut into plates of the required size.

An editor, getting tired of paying printers, concluded to put his own shoulder to the wheel. Here is a specimen of his effort at setting type:

"we tuinK we shuld do moSt o f ouı
ɘn setTing ɹʎpe ɥereafıeɹ—PaiɯeRs
ɯay taIk abouɹ ıt bŒing diɯeuıt to seɹ
ʇʎpe, buɹ ɯe don't exPerience ɯny diffiɔuıty.

☞ Read the advertisements.

New Oil Stove.

We herewith present a cut, with description, of "DOPP'S IMPROVED WICK BURNING STOVE," patented September 11th and November 20th, 1866. For the first time in the history of petroleum, it appears that a cooking stove has been invented that burns directly from a wick, with the same facility and thoroughness of combustion that is obtained in the ordinary chimney lamp, any of the inflammable oils, such as lard, whale, resin, seal, cotton seed, and coal oils *of any and all gravities*—the heaviest as readily and perfectly as the lightest, *crude or refined*, without smoke, smell, soot, or any offensive residuum.

This stove performs all the ordinary branches of cooking—roasting, baking, broiling, boiling, etc., and the heating of flatirons, to perfection, and it appears to be the most economical stove in use. Being extremely simple and entirely devoid of intricate mechanism it is easily operated; its apparent freedom from liability to get out of order by use, and its complete arrangement

DOPP'S IMPROVED WICK BURNING STOVE.

The Reservoir is divided into two compartments, the upper containing water, and the lower one oil.
A, The Pipe to convey oil to the wick.
B, The Pipe to convey water to surround the wick.
C, Lever to raise and lower the wick.
D, Boiler with cover. F, Portable Oven.
H, Mica windows to show the size of the blaze.

for regulating and controlling the consumption of fuel, its perfect safety, with its admirable performance of all the services of a *cooking* and *heating* stove, pronounce it to be the long sought desideratum of the age.

We have examined the stove thoroughly and seen it in full operation; it is complete, and fully comes up to all that is claimed for it in economy, efficiency, cleanliness, and simplicity of management, and should be adopted by every family.

Messrs. Hedge & Van Dine, 602 Broadway, N. Y., (where the stoves can be seen in operation,) manufacture and sell these stoves, and also have the sale of State, county, or town rights, or application for rights to manufacture and sell, can be made to the editor of this journal, either personally, or by letter.

NEW UNDERGROUND TELEGRAPHIC SYSTEM.—A number of gentlemen connected with telegraphy have been at the residence of Mr. D. Nicoll, Oaklands Hall, Kilburn, for the purpose of witnessing a series of experiments with a new species of underground electric telegraph. The principle consists of its being made in sections of any length, and at any angle, and laid down in shallow or deep trenches at option, just as a line of railway may be laid, but without chairs, bolts, rivets, etc. The system is described as being of exceedingly simple construction, consisting of a zinc or other metallic semi-tube, or species of gutter, in which any number of electric wires can be laid. In manufacturing the conductors the wires receive first a coating of insulatory substance, then a coating of fibre, and each wire is then embedded in the semi-tube, and embedded in more of the insulating compound. This insulating material does not decompose. It consists mainly of *epure*, Trinidad bitumen, and with 16-guage copper wires in zinc troughs the system can be laid and completed, it is said, for 20 per cent. less than the present cost of overhead wires, either on poles or housetops. It has been calculated that twenty miles of sections, containing fifty or more wires, may be laid in a day by thirty laborers. The cost of each wire will, it is said, ordinarily average not more than £5 per mile.—*Builder.*

SUPPLY OF WATER FOR LONDON.—A communication from Mr. R. H. Smith, F. C. S., printed in the *Laboratory*, bears on the great scheme for supplying London from Bala Lake. A sample of water was taken from the lake on Monday, July 15th, and examined on the following Wednesday. The result arrived at is that, although this water is beautifully soft, it is not remarkable for its freedom from organic impurity. In albuminoid or putrescible nitrogenous matter Mr. Smith declares that this water is on a par with that of the Thames at Hampton, and hence concludes that it will not do for London.—*Ibid.*

—Music in processions is not allowed in New Orleans during the epidemic.

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